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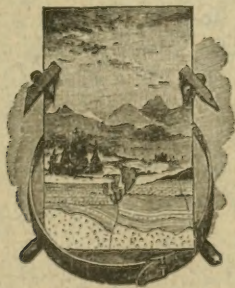
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CASCADE RANGE AND ASHLAND FOREST RESERVES
AND ADJACENT REGIONS

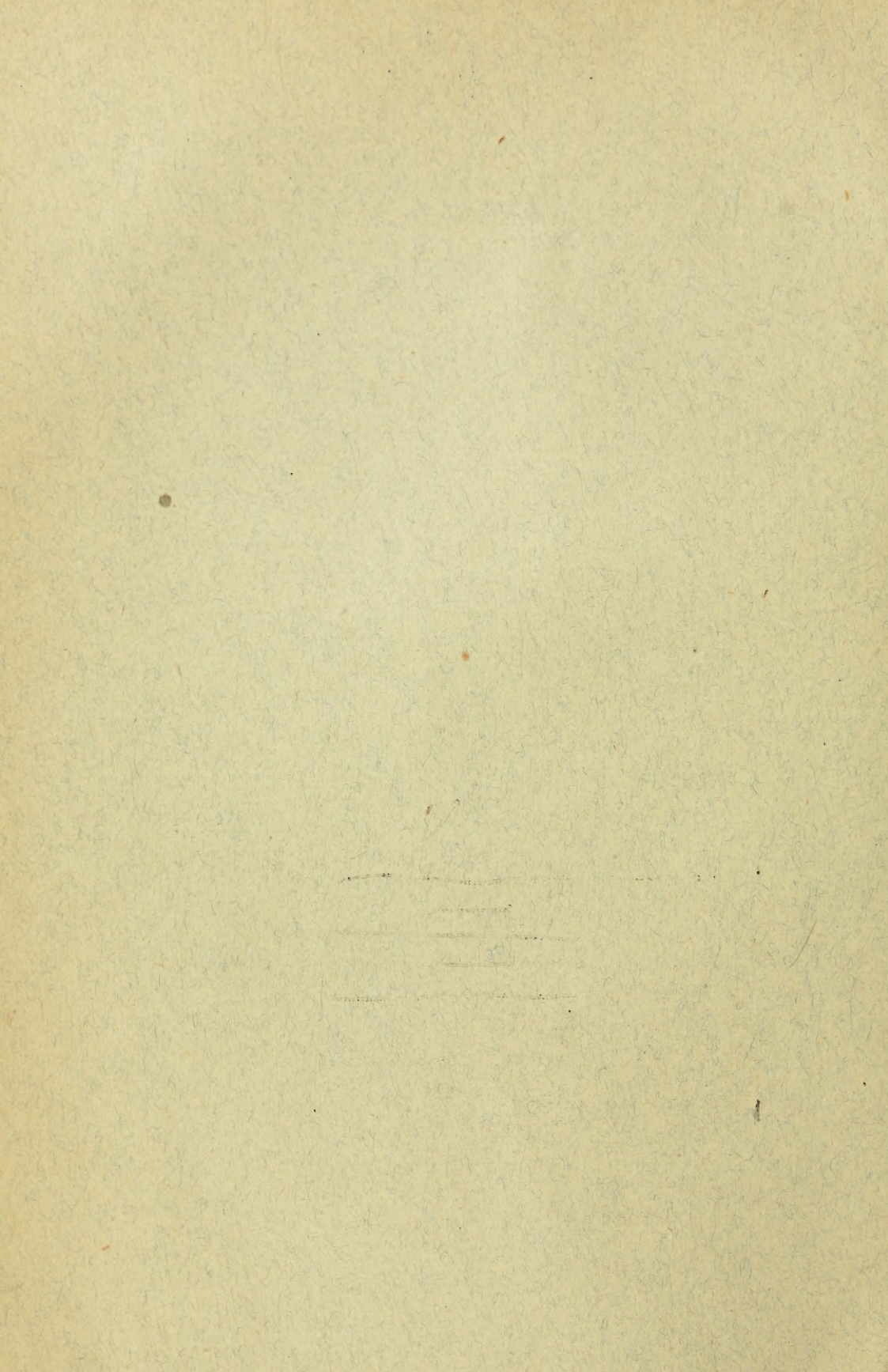
BY

JOHN B. LEIBERG

EXTRACT FROM THE TWENTY-FIRST ANNUAL REPORT OF THE SURVEY, 1899-1900
PART V, FOREST RESERVES—HENRY GANNETT, CHIEF OF
DIVISION OF GEOGRAPHY AND FORESTRY



WASHINGTON
GOVERNMENT PRINTING OFFICE
1900



CASCADE RANGE FOREST RESERVE, OREGON, FROM TOWNSHIP 28 SOUTH
TO TOWNSHIP 37 SOUTH, INCLUSIVE; TOGETHER WITH THE ASH-
LAND FOREST RESERVE AND ADJACENT FOREST REGIONS
FROM TOWNSHIP 28 SOUTH TO TOWNSHIP 41 SOUTH,
INCLUSIVE, AND FROM RANGE 2 WEST TO RANGE
14 EAST, WILLAMETTE MERIDIAN, INCLUSIVE

BY

JOHN B. LEIBERG

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CASCADE RANGE AND ASHLAND FOREST RESERVES AND ADJACENT REGIONS.

By JOHN B. LEIBERG.

TOPOGRAPHICAL FEATURES.

The region discussed in this report consists of a tract of country in the southern portion of the State of Oregon, between longitude 121° and 123° west, and between latitude 42° and 43° 45' north. It contains 4,676,360 acres. It comprises the central and upper areas of the Rogue and Klamath river basins, together with a small portion of the watershed of the Upper South Umpqua River.

The region is divided into two nearly equal portions by the main range of the Cascades, which strikes through it in an almost due north-south direction. The two regions thus formed, the western and the eastern slope, present many very dissimilar characteristics in their orographical and general topographical features.

REGION WEST OF THE CASCADES.

The orographical features of the region west of the Cascade Range are the backbone and lateral ridges of that range chiefly, supplemented in the southern areas by portions of the Siskiyou Mountains and their northward-projecting spurs, and in the northern districts by the Rogue River-Umpqua divide and its system of southerly laterals.

The Cascade Range is the principal mountain system. If we may judge from rock exposures in the region of the Upper Umpqua forks, the central core of the range is a broad, massive axis composed mainly of porphyry. It is, in most localities, overlain and capped by immense deposits of volcanic rocks, lava of various ages, pumice detritus, lapilli, and the like. Its summit from Diamond Lake, the northernmost point of the region included in this report, to the California line is, broadly speaking, a plateau-like area with a mean elevation of 6,000 feet. Its width varies from nearly 10 miles in the region south of Diamond Lake to 2 miles at the head of the Middle Fork of Rogue River, and to 4 miles a short distance north of Klamath Gap. The summit plateau is capped in many localities by rocky

combs, or is broken by short, steep escarpments, while here and there rise from it volcanic cones whose fires have long since become extinct.

The slope stretching westward from the summit consists of a region with a mean elevation of 4,000 feet. Like the summit plateau of the range, it is covered mostly with volcanic rocks. It is not, however, a lava-covered region throughout, as is commonly believed. The western sections present many exposures of magnesian rocks and along the central areas of Dead Indian Creek these rocks are only very thinly covered by lava. The western slope is widely furrowed by the numerous canyons which form the Rogue River drainage system. The slopes of the canyons are usually steep and rocky, but, with the exception of the upper portions of the main Rogue River forks, the canyons are of no great depth. Irregular crests and ridges, generally of low elevation, separate the various canyons, which occasionally expand into flats. All of these flats have the appearance of having at some period been lake bottoms formed by lava streams which temporarily dammed the different drainage channels.

The entire tract here termed "the western slope of the main range of the Cascades" has a width of 35 miles. It rises abruptly, with a steep, bold front in the southern portion, and not so steep in the northern, from a depression which forms a sort of dividing line between the eastern terminations of the Coast Ranges and the Cascades. The depression is in the form of a valley 4 to 5 miles wide along Bear Creek, an affluent of Rogue River.

In the region under consideration the Cascade Range is cut in two by Klamath Gap. The gap is a narrow canyon through which the waters of the Upper Klamath region find their way to the ocean. In its canyon form the gap commences on the eastern side of the range at the point where Klamath River emerges from the marshes at the foot of Upper Klamath Lake. The upper portion of the canyon, which is all that comes within the scope of this examination, consists of a narrow trough varying from one-third to $1\frac{1}{4}$ miles in width and is excavated through a lava formation which evidently here is of very great thickness. The slopes of the canyon are steep and rocky, and the bottom, in the upper portion of its course, is but little wider than the breadth of the stream. A few miles below the point where the canyon crosses the southern border of Oregon and enters California it attains a width of 2 miles or more. Klamath Gap is supposed to have been at some time a powerful factor in modifying the extensions of the flora of the Cascades and the Sierra, but the upper portions of the gap are much too narrow in many places ever to have formed an effectual barrier against floral migrations or extensions.

Orographically Klamath Gap separates the Cascade Range from the northward extensions of the Sierra Nevada. If the gap did not exist

the southern Cascades might be viewed as constituting a portion of the Sierra system geologically as well as orographically. But so far as rock exposures permit us to form an opinion, it appears that the porphyry axis of the Cascades and the flanking deposits of magnesian rocks have their extensions in the Siskiyou Mountains and not in the Sierras across the gap.

The volcanic character of the Cascades has already been mentioned. The summit of the range from Mount Thielsen, near the south end of Diamond Lake, to the southern edge of T. 38 S., is dotted with numerous extinct volcanic cones. Some of them are imposing peaks, as Mount Thielsen, Union Peak, and Mount Pitt, the latter reaching a height of 9,760 feet, or about 4,700 feet above the plateau summit. Other cones, mostly unnamed or locally known generically as "goose-nests," attain elevations of 500 feet to 1,200 feet above the general summit level of the range. The cones and peaks present various aspects. The smaller ones, which are the most symmetrical in appearance, are usually truncated cones with a comparatively shallow central depression. Others, like Mount Scott and Mount Pitt, present a symmetrical outline when viewed at a distance, but are found to be of rough and irregular shape on close inspection. The more elevated cones and peaks have been subject to moderate glacial erosion, sufficiently intense, however, to modify materially the original outlines of the cones. Some appear to have had their vents lateral from the first, in others, toward the later periods of their existence, fresh craters or fissures opened far down on their slopes and as a result huge masses of the cone were blown out.

The cones and peaks are also of different ages. As one center of activity died out another arose some distance away. Some of the cones are extremely ancient, their fires quenched ages ago; others appear to have ejected volcanic material until within comparatively recent times, geologically speaking. From the difference in erosion between the two classes we may conclude that the smaller and better preserved ones are the younger, and that the larger and more eroded peaks are the more ancient. It is certain, however, that within recent geologic times, after a long period of quiescence, several of the larger and older centers of volcanic activity in the range suddenly broke out and sent forth great quantities of remarkably rough, highly vesicular lava. Especially noteworthy in this respect are Mount Pitt and Mount Brown, the latter situated about 4 miles south-southeast of the former. Surrounding their bases, and in the region between them, are large areas covered with the rough vesicular type of lava alluded to which has been so recently emitted that as yet no vegetation, except lichens and mosses, has obtained foothold on the rough and barren surface of the flows.

One of the most remarkable of the volcanic centers in this region

is in T. 34 S., R. 5 E. It consists of five craters grouped around a common center and covering an area of 18 square miles. Its igneous activity ceased ages ago, but while in operation there were emitted from its craters vast masses of a homogeneous type of lava which flowed in all directions. It is one of the most ancient igneous centers in this portion of the range.

Several of the extinct volcanoes now contain lakes in the former craters. Such is the case in the locality mentioned above, but famous above all others in this respect stands Crater Lake. This lake occupies a deep depression on the summit of the range, nearly circular in outline, hence crateriform. The depression is supposed to be due to the subsidence of a large peak or cone which formerly existed here, or to the rending asunder and subsequent violent depression of the peak by volcanic eruptions of great energy.

The ejecta from the volcanoes have been of three general classes, namely, lava of various compositions, pumice, and lapilli or small fragments of rock which lack the coarsely cellular structure of the pumice. Much of the lava has apparently come from fissures, but the pumice and lapilli have been forced out through crateriform openings. In the category of ejecta must also be classed the large quantities of brecciated lava which occur plentifully throughout the volcanic areas of the western slope. This material can not be traced to any crater, but appears to have been forced out through fissures in a thick plastic state. In its course to the surface angular fragments of rock were torn from the fissured strata through which it was forced. These angular pieces of hard rock projecting from the surface of the lava by reason of unequal weathering make these brecciated masses conspicuously rough and uneven on their surfaces. While nowhere comprising a very large area they occur in so many localities that their aggregate acreage is considerable. Remarkably hard and barren, and usually entirely devoid of soil covering, these breccias do much toward thinning the average forest stands in the regions where they occur.

The character of the lava ejected by the proper volcanic vents varies greatly. The older lavas usually are hard and massive, but in some localities exhibit a short, irregular, thin slaty cleavage. The more recent lavas, on the other hand, are extremely rough and vesicular. Between the two extremes are found innumerable modifications.

The surface of the pumice deposit varies from a fine, almost ash-like detritus, to coarse angular fragments a foot or more in diameter. Enormous quantities were ejected from every vent on the range north of the southern boundary of township 34, burying deeply the summit and immediate slopes. The pumice deposit extends westward about 18 miles from the summit of the range. It is, and has been, of importance in many ways. It has filled up the crevices and smoothed out the asperities of many of the lava fields. It has filled the bottoms

of many of the valleys, and has made large, level, and comparatively fertile flats where otherwise would have been a narrow, rocky trough. As a water sponge its present importance is very great. South of Union Peak the pumice is more or less mixed with lapilli, consisting of porphyritic rocks. These lapilli appear to have been blown out partly through the vent in that peak, and partly through a number of smaller cones situated between Union Peak and the head of the Middle Fork of Rogue River. Many of these lapilli are so little altered by their passage through the throat of a volcano, that the iron sulphides, which they contain in great abundance, have not even been desulphurized. The lapilli are exactly similar to the porphyry dikes which are found, uncapped by lava, throughout the region of the headwaters of the South Umpqua River, 30 to 40 miles northward.

South of the Middle Fork of Rogue River the pumice deposits cease or become very thin and scattering. The crest of the range is a mass of rough, uneven lava flows, in some places slightly smoothed over by deposits of lapilli, which take here the place of the pumice detritus farther north. The part played by the pumice in smoothing the asperities of the lava can nowhere be seen to better advantage than in the marked contrast offered by the Cascades summit outside and within the pumice-covered area.

Almost the entire drainage of the western slope finds its way into Rogue River. The exceptions consist of a few small streams, mere creeks, in the southern areas, which flow into Klamath River.

The chief forks of Rogue River are the North, the Middle, and the South. The affluents which form the North Fork head partly in the Rogue River-Umpqua divide and partly in the Cascades between Mount Thielsen and Union Peak. The tributaries of the Middle Fork head in the region between Union Peak and Klamath Point, while those which form the South Fork rise on the slopes of the broad platform which skirts the base of Mount Pitt on the north, west, and south. A large portion of the drainage from the extreme southern areas finds its way into the main river direct through Bear Creek, Indian Creek, the Big Butte Creek systems, and various lesser tributaries.

The canyons of the North Fork which head in the Cascades rise in ridges deeply covered with pumice and in flats which are sometimes grassy and marshy. Many of the canyons are deeply excavated in the soft and easily transported pumiceous material. In late years extensive forest fires have greatly accelerated the cutting process, which in time will doubtless transfer most of the pumice covering of the western slope of the range to lower levels. Although composed of such soft and loose material the slopes of the canyons in the pumice belt stand at a remarkably high angle, so much so that in many localities they offer an impassable barrier. The main stream of the North Fork runs through a

valley which varies in width from three-fourths of a mile to 3 miles. Primarily, it is not a valley due to erosion, but it was formed by the direction and position assumed by the different lava flows which have covered the region. A long time ago a large portion of the depression in which the stream now flows was a lake, made so by a huge lava dike crossing the valley near the southwest corner of T. 32 S., R. 3 E., and the northeast corner of T. 33 S., R. 2 E. In this lake a mass of pumice was deposited, which smoothed out the inequalities of the original surface of the depression. In process of time the overflow from the lake cut through the dike, leaving a series of rapids and falls behind. The river began to excavate its channel through the pumice material, cutting a trough, which at the present time is 350 to 400 feet in depth and is marked by five to six terraces. As the river has eroded its bed, various lava dikes and inequalities of the ancient bottom of the valley have become uncovered. These have given rise to peculiar and interesting narrowings of the stream. Thus in T. 30 S., R. 3 E. the entire volume of the river, 150 to 250 feet in width and having a depth of 7 to 9 feet, in the early summer stage of flow, is forced through a rocky cleft 5 to 6 feet in width. Similar places occur in the channel of the stream in T. 31 S., R. 3 E. The falls and narrowings in the North Fork of Rogue River form insuperable obstacles to log driving.

The canyons of the Middle Fork head partly in pumice-covered tracts, partly in rocky glaciated areas. There commonly exists at their heads one or several small marshy or sedge-covered glades. Three principal tributaries form the Middle Fork. The one farthest south heads in a group of small lakes; the middle one has its rise in a series of large springs, numbering several hundred, which suddenly burst out from under a lava cliff. The character of the canyons of these tributaries of the Middle Fork is determined mostly by the position and thickness of the adjacent lava flows. For example, in the case of the southern affluent of the Middle Fork the canyon wall south of the stream is formed by a steep ridge of lava, which rises 1,800 to 2,000 feet above the stream, while on the north the canyon wall is a series of low, rocky terraces, ending in wide flats or in low ridges of easy slope. The main channel of the Middle Fork lies across a level, or nearly level lava sheet. The stream has made a clean cut 400 to 500 feet in depth through the lava, forming a canyon of this depth with nearly perpendicular slopes. The channels of the Middle Fork and its affluents are littered with large boulders, and are broken by falls and rapids near their heads, rendering them unsuitable for log driving.

The drainage system of the South Fork of Rogue River consists chiefly of one large canyon which heads in the northern base of Mount Pitt. It is narrow and rocky throughout its entire length, and is

deeply sunk between steep, rough lava flows. Near its head the canyon widens in a few places and contains several lakelets, one of which is $1\frac{1}{2}$ miles in length and 350 to 400 yards in width.

Among the streams which flow directly into the main channel of Rogue River the Big Butte and the Little Butte are the most noteworthy. The former heads in the western and southern areas of the base of Mount Pitt. Its various tributaries are fed by large springs which issue from beneath the lava fields that surround the peak. Its course lies partly through canyons which here, as elsewhere in the region, are fashioned, as to their depth and character of slope, more by the configuration of the inclosing lava flows than by the effects produced by stream erosion, and partly through series of broad flats, which furnish good grazing and agricultural facilities.

Little Butte Creek heads partly in the southern base of Mount Pitt, and partly in a series of large flats in T. 37 S., R. 3 E. The largest of the northern affluents has as its reservoir Fish Lake, a shallow sheet of clear, cold water 4 to 5 feet in depth, 2 miles in length, and 400 to 500 yards in width. Its water level, apparently not subject to much variation, is maintained by huge springs in the northeast corner, which issue from under the mass of recent lava between Mount Pitt and Mount Brown. The outlet of Fish Lake is through a narrow bottom inclosed by banks 75 to 80 feet in height. It could readily be transformed into a large reservoir. Little Butte Creek, although a small stream, is of importance from the circumstance that its waters are largely diverted for purposes of irrigation in the Rogue River Plain.

The drainage which reaches Klamath River from the southern areas flows mostly by way of Spencer and Jenny creeks, both small streams of little importance.

Portions of the summit of the range and the western slope owe some of their topographic features to glacial erosion. In the pumice-covered areas glacial action was either feeble or altogether wanting, except on the highest summits, or the effects of glaciation, if it did occur, are hidden under the pumice. Where the pumice thins out, a few miles south of Klamath Point, the evidence of glacial action is more apparent. The summit of the range and the eastern slope present here the most conspicuous evidences of the presence of glaciers. On the western slope the evidence is much more apparent. The ice tore out the rims of many of the craters and scooped out many little depressions in the broad lava field which lies between Mount Pitt and the head of Cherry Creek, on the eastern side of the range. These depressions have filled with water and now are lakes. In other places the ice flowing down from the summit of the range excavated deep channels on the eastern side and spilled its load of drift blocks and gravel at the mouths of the canyons opening on the edges of Upper Klamath Lake. But, on the whole, with the exception of the region

centering around the group of five craters previously described, glacial erosion was feeble throughout the Cascades in this region. It is difficult to understand why glaciation was so much more active in the region contiguous to this group of craters than elsewhere. The thickness of the ice sheet here must have been many hundreds of feet, and it must have existed for a long time. In its descent to lower levels it excavated a channel 1,000 feet in depth, which now forms the canyon of Cherry Creek. All of the rocks over which it passed are deeply marked with straight, broad grooves.

SISKIYOU MOUNTAINS.

The area of the Siskiyou Mountains described in this report comprises 400 square miles, the greater portion of the range lying outside the limits of the present examination.

Orographically the range forms a connecting link between the Coast Ranges and the Cascades. In T. 40 S., R. 3 E., it swings out from the Cascades in a westerly direction with a narrow, sharp curve, its porphyries and serpentine rocks coming to the surface from beneath the lavas of the western slope of the Cascades. The inner or northerly curve of the range presents a bold, steep, terraced front. The outer or southerly curve slopes away with a more gradual descent toward the Klamath Valley.

Where it leaves the Cascades, the crest line has an elevation of 5,200 feet. It is here a narrow backbone flanked by regions of extremely irregular surface. Sharp, narrow ridges set off by conical elevations and alternating deep saddles, with numerous intersecting ravines and canyons, constitute the relief of the upper slopes of the range in this locality. In T. 40 S., R. 1 E., the crest line rises to a height of 7,662 feet in a rocky elevation known as Siskiyou Peak or Ashland Butte, a prominent landmark for the surrounding region.

From Siskiyou Peak westward the summit of the range is narrow, seldom widening to 400 yards, often a mere hogback a few feet in width. The northern slope for the first 2,000 or 3,000 feet from the summit is steep and abrupt, and the southern slope differs but little in its gradients. The central mass of the range here, as where it leaves the Cascades, is composed of old eruptive and metamorphosed rocks, porphyries, serpentine, and granites. The lowest northern slopes are largely made up of talcose slates having a thinly laminated structure and resting on granites and porphyries. The volcanic cones and vents and the great lava flows and pumice deposits which are the predominant features in the geology of the Cascades in this region are absent from the Siskiyou Mountains.

The streams flowing from the range lie in deep canyons whose origin appears to be due chiefly to the erosive powers of water and ice.



I. SUMMIT OF SISKIYOU MOUNTAINS, NEAR STERLING PEAK



II. SUMMIT OF UMPQUA DIVIDES, LOOKING NORTHEAST FROM ABBOTS BUTTE

Most of the larger canyons present clear evidences of the former existence of glaciers. Especially is this the case with the upper portion of the canyons which head in Sterling Peak, where the streams have not yet removed or smoothed out the lateral and terminal moraines which roughen the bottoms of the valleys (Pl. LXXIII, A).

The streams usually rise in grassy glades; at least such is the rule with those that head in the main range. Most of the glades are small in extent; but a few of those which form the heads of the larger affluents of Beaver and Humbug creeks, on the southern slope, each contain several hundred acres.

The canyons which drain the northern slopes occasionally widen in their lower portions and afford considerable tracts of agricultural and meadow land.

In this region the northern spurs of the Siskiyou stretch northward to a distance of 20 miles from the main range. They parallel the steep front of the western slope of the Cascades, from which they are separated by a strip of semiarid valley consisting of the basin of Bear Creek, a tributary of Rogue River.

UMPQUA MOUNTAINS.

The Umpqua Mountains comprise a wide strip of rough and rugged country between the Rogue and Willamette rivers, and form the drainage basin of Umpqua River. The examination extended only to a portion of the system which forms the divide between the upper reaches of the Rogue and South Umpqua rivers, comprising 350 square miles.

The divide, so far as the examination went, consists of a porphyry axis branching out from the Cascades in T. 28 S., R. 5 E., a little north of the south end of Diamond Lake, an extinct volcanic cone known as Old Bailey Mountain marking the point of departure. Its course is in a general westerly direction. Here and there, along the crest and flanks of the divide, the porphyries, more or less altered by volcanic heat, come to the surface. Generally, however, the more ancient rocks are covered up by deposits of the more recent Cascade lavas, but the blanket of lava is not so thick as along the western slope of the Cascades, except near the angle of junction with this range. Most of the deposits of lava appear to have flowed from local fissures, except where the divide joins the Cascades. At this point volcanic cones, similar to those which occur elsewhere in that range, make their appearance.

The summit of the divide is in most places a narrow crest, a mere hogback a few feet in width. Abbots Butte is, however, an exception. This elevation is situated directly on the main divide, but instead of being a narrow crest it is a broad, terraced volcanic mass level

on its summit. Alternating deep saddles, where streams head and flow in opposite directions, and high, rocky, precipitous elevations make up the crest line (Pl. LXXIII, *B*).

The streams flowing from the range lie in deep canyons. Near their sources the slopes are steep and frequently nearly perpendicular. At the heads of the larger streams usually are small glades, while narrow stretches of level land exist here and there along the lower courses of the canyons, particularly along those which flow into Rogue River.

The general basin of the South Umpqua is a broad east-west depression, with its bottom consisting of a multitude of small canyons and comparatively low ridges, the whole inclosed between high, rough dividing ranges. The landscape is remarkably different from that which characterizes the drainage basins elsewhere on either slope of the Cascades in this region. On viewing it in its entirety one receives the impression that the area constitutes one of the primal drainage basins in the Cascades, one which was not affected by volcanic outbursts to the same extent as were the other adjacent areas, but remained comparatively free from the great outpourings of lava which so often in the past changed the aspect of other areas on the western slopes of the Cascade Range.

REGION EAST OF THE CASCADES.

The eastern slope of the Cascades presents a sharp contrast to the features which distinguish the western declivities of the range. This is mostly due to the abrupt rise of the mountains and consequent shortness of slope. From T. 36 S. northward to the extent of the present examination the distance from base to summit of the range in an air line is from 6 to 10 miles, as compared with a general average of 30 miles on the western side. South of township 35 the main range is separated from the plains' level by a short intermediate mountain mass of volcanic origin, which fills Ts. 37, 38, and 39 S., R. 6 E., with a great number of rough and rocky ridges.

The declivities of the eastern slope are generally steep, rocky, and irregular, or somewhat terraced lava flows. North of T. 36 S. pumice deposits have smoothed out a great many of the lesser asperities. In T. 28 S., Rs. 6 and 6½ E., there is a broad, very gentle slope from the plains' level to the summit of the Cascades at the south end of Diamond Lake, forming one of the easiest passes in the range. The pass leads to the head of the North Fork of Rogue River.

The canyons on the eastern slope are of two general classes: (1) short and straight canyons, with abrupt slopes and descents; (2) longer canyons with an oblique direction in their relation to the course of the main range, where they possess a more easy and gentle gradient. The short and straight canyons are chiefly canyons of erosion. At their openings there is commonly piled up a mass of boulder drift. The

other variety consists of depressions due to the position and course taken by the inclosing lava masses in which the streams sometimes have cut deep secondary canyons and gorges. Anna Creek, in Ts. 31 and 32, R. 6 E., furnishes an example of the latter kind; while Three-mile, Cherry, and Rock creeks, in Ts. 34 and 35, R. 6 E., are of the former type.

The region to the east of the Cascades forms, so far as our limits go, the upper drainage basin of Klamath River. The orographical features of the region consist of: (1) the Klamath-Deschutes divide; (2) many volcanic ridges of varying altitude, which are more or less connected, some of which intersect the basin in a north-south direction, while others intersect in an east-west direction.

The Klamath-Deschutes divide branches out from the Cascades approximately in T. 26 S., R. 7 E. It swings around to the southward and constitutes a span bridging Klamath Gap. The ridge is of volcanic origin, is extremely ancient, and may at some past time have been of much greater altitude. If so it would constitute a sort of highway for migrations of animals and plants from the northern Sierras to the Cascades, and vice versa.

The volcanic character of the ridges which intersect the Klamath drainage basin in this region has already been alluded to. Some of these ridges have been built up around volcanic vents, others are irregular masses whose origin perhaps is to be sought in earth fissures. The entire basin seems originally to have been a plateau area. The lava outflows inclosed many flats, which in time became lakes. Most of these lakes have been drained by their waters cutting channels through the lava dams. Others are in various stages from marshes to shallow lakes.

Extinct craters abound. Some formed parts of long ranges, or rather were the centers from which flowed long streams of lava. Such are Yamsay Peak, Swan Lake Point, Fuego Mountain, Yainax Butte, and various unnamed craters in the Black Hills. Others occur as isolated conical hills scattered throughout the region. Some of the lava flows which came from these vents spread out over the region in vast, flat sheets, others are heaped up in ridged and terraced masses. The igneous activity in the basin is not yet altogether quenched. The hot springs in the southern areas, which frequently lie in long lines, indicate that there are many pressure lines and fissures which are not yet closed.

The northern area and much of the central are covered with a layer of pumice. Some of the pumice came from vents in the Cascades, much of it was ejected from craters in the basin, notably from those in the Yamsay Range. Near the Cascades the pumice deposit undoubtedly is very thick. In the eastern and southeastern areas of the basin it is thin, in some places not more than $\frac{1}{4}$ to 8 feet in thickness, much of it evidently having been washed away.

The plain or depression which stretches along the base of the Cascades in this region is comparatively narrow, varying from 10 to 15 miles in width. It consists of two distinct terraces, a northern and a southern, the former elevated about 400 feet above the latter. The terraces connect through the valleys of Williamson and Sprague rivers with the terrace or plain which borders the central areas of Sprague River. Through the valley of Sycan River the Sprague River terrace connects with the lesser level areas which form Sycan Marsh and adjacent regions. The connection between each of these terraces is invariably through a stretch of narrow canyon which represents a cut through a lava flow.

The southern terrace in front of the Cascades comprises the basins of Upper Klamath Lake with the adjoining marshes, together with a portion of Lower Klamath Lake and a level valley area along the lower portion of Lost River. This terrace contains 450 square miles and extends from the northern line of T. 33 S. to the Oregon-California line.

Upper Klamath Lake is mostly a shallow body of water. It is a lake chiefly because the lava flows at its foot and at the point near Plevna where Klamath River leaves the marshy areas have not been cut down sufficiently to drain the lake. If the falls in Klamath River were lowered a few feet the greater portion of Upper Klamath Lake would become dry.

The upper terrace is separated from the lower by a broad, thick lava flow, which stretches from northwest to southeast, and possibly may have come from Mount Scott or adjacent craters. The lava flow created a large lake, of which all that remains is Klamath Marsh, most of its area having been drained by the Williamson River cutting a canyon through the lava flow at a point 8 miles east of Fort Klamath. The upper terrace stretches northward to the Klamath-Deschutes divide. Eastward it extends to the foot of the Yamsay Range, which it follows southward along the western base to the head of Williamson River.

The pumice covering both on the upper and on the lower of these terraces was deposited when they were deeply covered with water. The present smoothness of their surface, only roughened by ancient beach lines along higher levels and by the courses of modern streams, proves this. Some of the pumice appears to have been thrown out as fine particles. Much of it came as large, coarse fragments or boulders a foot or more in diameter.

The Sycan terrace is situated east of the Yamsay Range and has an elevation of 5,000 feet. It likewise was a lake in past geologic times. It was formed by a lava flow which came from a crater, now extinct, situated in the Fuego Range. Sycan River has cut through the obstruction, the lake has been drained, and a swampy tract known as Sycan Marsh now remains.

The Sprague River terrace consists of an area bordering Sprague River westward from the junction of its main forks. It covers an area of 260 square miles. As in the case of the other terraces, the Sprague River area was once a lake bottom. The lake owed its origin to a lava flow from the volcanic centers near Swan Lake Point. Much of this terrace has been denuded of its pumice covering and the underlying rough lava is brought to view or it is covered with gravel and small boulders. The terrace is a semiarid region.

Here and there throughout the entire Upper Klamath Basin are scattered smaller terraces or flats more or less completely surrounded by thick lava flows. One of the larger is Swan Lake Valley. This is a level tract inclosed by lava flows which came from Swan Lake Point. It is remarkable for a thick deposit of diatomaceous earth, which underlies the entire flat at a depth of a few feet.

The higher points in the region show marks of light glaciation, but the terraces and flats show no clear evidences of the scoring or wearing effects of ice. Here, as in the Cascades, the smoothness of the pumice deposits proves either that glaciation preceded their deposition or that the region has not at any time been subject to the action of ice. The removal of the pumice down to the underlying lava on the Sprague and Sycan terraces is due to local effects of drainage.

The streams in the region flow mostly in shallow canyons. The exceptions are at the points where they have cut their way through lava flows stretching across their courses. Some of the streams, such as Sprague River, have excavated their beds to a depth of 20 to 80 feet below the general level of the terrace through which they flow, and have one or two narrow benches in their troughs to mark the stages of the erosive process. Owing to the volcanic nature of the region and the numerous fissures in the lava bed rock a great many of the streams flow irregularly. Many of them sink and disappear, only to be forced to the surface at some other point. Williamson River and, in part, Sycan River head in large springs which suddenly burst out with great force from under thick masses of lava of the Yamsay Range. Such is also the case with Crooked River and Fort Creek, streams near Fort Klamath, and with many other lesser creeks.

CLIMATIC CONDITIONS.

Broadly stated, the general climatic features, as regards precipitation, may be referred to two classes: first, areas with an abundance of precipitation; and, second, areas characterized by semiaridity, or a low ratio of rainfall. The former are characteristic of the western slope of the Cascades, the latter of the eastern, but the range is by no means a strict dividing line in all cases, as areas possessing either feature are found on both sides of the range.

Local conditions modify the precipitation. The chief of these exists in the relief of the region, and altitude is the more prominent factor here. We thus have on the western slope true semiarid conditions in the low-lying valleys, and on the eastern slope, at high elevations, decidedly humid ones. Both the western and eastern slopes may, therefore, be divided into semiarid, subhumid, and humid belts.

WESTERN SLOPE.

SEMIARID REGION.

Areas of this character occur here under two aspects: first, those naturally semiarid; and, second, such as have assumed this condition through the agency of man.

The first of these have their origin in the relief of the country, and possibly in slow climatic changes taking place over the entire western slope of the Cascades and connecting ranges along the coast. They are permanently semiarid, and, if the climatic hypothesis be true, they are gradually enlarging their area.

The second, induced through conditions created by the agency of man, probably are only of temporary duration.

The larger naturally and permanently semiarid tracts on the western slopes of the Cascades in this region consist of: (1) the area of depression situated between the spurs projecting northward from the region around Siskiyou Peak and the terminations of the western spurs of the Cascades; (2) the areas embraced in the lower and middle slopes on the western spurs of the Cascades, where they front on the above-described depression; (3) a considerable tract among the Siskiyou spurs fronting on North Fork of Applegate Creek; and (4) areas bordering Rogue River in Ts. 35 and 36 S., Rs. 2 and 1 W. and 1 E.

The annual precipitation on these tracts probably does not exceed 15 inches. They are all characterized by having a small amount of arboreal vegetation, mostly confined to the banks of the water courses. They carry scattered copses of black oak (*Quercus californica*) and white oak (*Q. garryana*), interspersed here and there by stands of frutescent or, rarely, arborescent madroña (*Arbutus menziesii*), and with dense thickets of brush largely composed of chaparral (*Ceanothus cuneatus*).

The lowest elevation of the semiarid tracts is approximately 1,600 feet. From this level the curve of semiaridity rises to a height of 4,000 feet on the terminal declivities of some of the western spurs of the Cascades, as, for example, on the southwestern slopes of the Grizzly Range north-northeast from Ashland, and to 4,800 feet on various of the Siskiyou spurs bordering Applegate Creek. Where the curve of semiaridity crosses the Siskiyou main range and connects

with the semiarid region northwest of Mount Shasta, through canyons and over low ridges east of Pilot Knob, it rises to altitudes of 6,000 feet.

There are no points in this region where the semiarid tracts west of the Cascades join those situated east of the range. Not even through Klamath Gap is there a wholly uninterrupted connection; for Klamath Gap, where the river breaks through the orographic backbone of the Cascades, lies in a region that must be classed as subhumid at least.

The tracts on which a condition of temporary semiaridity has been artificially induced consist chiefly of old or recent burns in the forested subhumid areas. They are scattered over the entire slope, but are most numerous and of largest extent in Ts. 31, 32, 33, 34, and 35 S., R. 4 E., where they collectively cover an area of 50,000 acres. It is impossible to say with absolute certainty that the tracts just mentioned are semiarid as a temporary condition only. They are slopes and summits denuded of their forest covering forty or forty-five years ago through the medium of severe fires. They are now covered with brush growths composed of species characteristic of semiarid lands, and their aspect is exactly like that of the semiarid chaparral slopes of California. Areas having similar characters, but not so large, occur in Ts. 38 and 39 S., Rs. 4 and 5 E. There is at least an even chance that such tracts will not again reforest, in which event they will constitute evidence proving the northward advance of the arid conditions prevalent in the regions farther south.

SUBHUMID REGION.

The subhumid region includes the slopes and summits of the Siskiyou, Umpqua, and Cascade ranges, between elevations of 3,000 and 6,000 feet, with the exceptions detailed under semiarid tracts. The annual precipitation is unknown to me, and there are probably no data available as to the quantity. The forest growth indicates from 35 to 50 inches, according to elevation. The region is characterized throughout by forested areas with stands of timber varying from moderately heavy to dense.

HUMID REGION.

The humid region comprises slopes and summits above the 6,000-foot contour. The annual precipitation is unknown to me, but it certainly reaches considerably above 50 inches. The lower portions carry forests similar to those which occur on the higher tracts of the subhumid slopes; the higher bear subalpine growths of trees and other vegetation, with here and there a peak projecting above the limit of trees.

EASTERN SLOPE.

SEMIARID REGION.

The semiarid lands east of the Cascades in this region occur chiefly in the interior of the Klamath Basin. They just touch the eastern base of the range in Ts. 39 and 40 S., Rs. 8 and 9 E. They stand in intimate relationship with areas of like character south beyond the eastern Oregon border through various valleys and depressions, such as Lost River and its tributaries. Their extension northward ceases on the Sprague River terrace. They are characterized by the growth of various desert shrubs and by the occurrence of scattered small stands of western juniper.

With the exception of the tracts mentioned as occurring in townships 39 and 40, none of the areas at the immediate base of the Cascades can now be considered as truly semiarid. But the region comprised within the limits of the Klamath Marsh terrace shows decided tendencies in that direction. The leaning toward semiarid conditions is there shown by deficient reforestation of burned tracts in the lodgepole-pine stands, and the evident tendency of such places to become covered with a growth of desert shrubs or grasses in place of the former forest.

The semiarid tracts of the Klamath Basin east of the Cascades comprise in the aggregate, so far as they come within this region, 800 square miles. The annual precipitation is about 15 inches.

SUBHUMID REGION.

The larger portion of the area in the Upper Klamath Basin is distinctly a subhumid one. Without knowing the actual precipitation in the region, its actual status on this point is therefore more or less guesswork, but, judging from the density of forest growth, I would place it at the same horizon as in the areas between the 3,000- and 4,200-foot contours along the fronts of the western spurs of the Cascades—that is, 25 to 35 inches per annum. The subhumid condition becomes possible only by reason of the numerous ridges scattered throughout the basin, which give to much of it a mean altitude of between 5,000 and 6,000 feet.

The areas are characterized by extensive stands of forest of medium density with a vigor of growth not inferior to that possessed by similar stands west of the Cascades.

HUMID REGION.

The strictly humid areas are of small extent. They are limited to tracts along the main range of the Cascades and to the high peaks of the Yamsay and Gearhart ranges in the interior regions of the basin.

They are characterized by moderate, light, or very thin stands of forest of subalpine types and by the low, shrubby, and herbaceous vegetation belonging to tracts of high altitude in this region.

I have no temperature data for any portion of the region either west or east of the Cascades. None of the high peaks have a permanent snow line on all sides. On the summit of Mounts Pitt and Scott there is commonly some snow on the northern slopes throughout the year. Occasionally, deep drifts in shady ravines on the other slopes persist through the summer, but the rule is that southern and western exposures on even the highest peaks are free of snow during a portion of the year.

FOREST CONDITIONS.

SPECIES.

The forest is overwhelmingly coniferous. This is especially the case on the areas east of the Cascades, where broad-leaved species of trees form but a fraction of 1 per cent of the forest stands, and where two conifers, the yellow and the lodgepole pine, together constitute 88 per cent. West of the Cascades broad-leaved trees occur more plentifully, forming, on a numerical basis, about 6 per cent of the entire forest; and while among the conifers two species, the yellow pine and the red fir, particularly predominate, there is also a wider range of ratios among the balance than is found on the eastern side of the range.

The following species of coniferous trees form the sylvan elements, and in many and varied ratios and groupings make up the forests and its component types:

Coniferous trees in Cascade Range Reserve and adjacent territory, Oregon.

Yellow pine	<i>Pinus ponderosa.</i>
Sugar pine.....	<i>Pinus lambertiana.</i>
White pine	<i>Pinus monticola.</i>
White-bark pine	<i>Pinus albicaulis.</i>
Lodgepole pine	<i>Pinus murrayana.</i>
White fir	<i>Abies concolor</i> , including transitional forms to the northern <i>Abies grandis.</i>
Amabilis fir	<i>Abies amabilis.</i>
Noble fir	<i>Abies nobilis.</i>
Alpine fir.....	<i>Abies lasiocarpa.</i>
Red fir	<i>Pseudotsuga mucronata.</i>
Incense cedar	<i>Libocedrus decurrens.</i>
Alaska cedar.....	<i>Chamaecyparis nootkatensis.</i>
Western hemlock	<i>Tsuga mertensiana.</i>
Alpine hemlock.....	<i>Tsuga pattonii.</i>
Engelmann spruce	<i>Picea engelmanni.</i>
Pacific yew	<i>Taxus brevifolia.</i>
Western juniper	<i>Juniperus occidentalis.</i>

Among the various species of broad-leaved trees the following are abundant enough to become conspicuous factors in the forest:

Broad-leaved trees in Cascade Range Reserve and adjacent territory, Oregon.

California black oak.....	<i>Quercus californica.</i>
Pacific post oak.....	<i>Quercus garryana.</i>
Madroña.....	<i>Arbutus menziesii.</i>
Oregon ash.....	<i>Fraxinus oregona.</i>
Oregon maple.....	<i>Acer macrophyllum.</i>
Red alder.....	<i>Alnus oregona.</i>
Mountain mahogany.....	<i>Cercocarpus ledifolius.</i>
Birch-leaf mahogany.....	<i>Cercocarpus betuloides.</i>
Golden-leaf chinquapin.....	<i>Castanopsis chrysophylla.</i>
Oregon crab.....	<i>Malus rivularis.</i>
Aspen.....	<i>Populus tremuloides.</i>
Balsam.....	<i>Populus balsamifera.</i>
Black cottonwood.....	<i>Populus trichocarpa.</i>
Pale elder.....	<i>Sambucus glauca.</i>

In addition to the species enumerated there occur various kinds of willow, hawthorn, plum, and cherry.

In the sylva of the eastern and western side of the Cascades collectively, the broad-leaved trees constitute 6.5 per cent, on a numerical basis, including individuals with basal diameters of 4 inches and upward. On the western side, the oaks, madroña, and chinquapin, when estimated on a similar basis, form 5 per cent.

Although the broad-leaved trees show an appreciable percentage of the forest when estimated by their numbers, they sink into utter insignificance when the relative timber volume is compared with the coniferous growth. Owing to the circumstance that timber estimates have so far been made only on the basis of diameters and lengths suitable for mill timbers expressed in feet board measure instead of cubic contents, the broad-leaved species have been excluded from the estimates. It is, therefore, not possible to state in any but the most general figures the relative proportion in volume between the broad-leaved and the coniferous growths. From various data obtained in the cruising during the current year I should place the relative proportion of the two divisions of the sylva in the ratio of 1 to 0.001, or, in other words, for every cubic foot of timber derived from broad-leaved species there are 1,000 cubic feet of timber of coniferous species. Were it not for the considerable oak and madroña growth on the low-lying semiarid and contiguous regions in the Middle Rogue River Basin the broad-leaved species would not show anywhere near so large a ratio. On areas situated within the middle and upper elevations and throughout the forested regions east of the Cascades the timber volume of species other than conifers is excessively small.

The following tables give the ratios between the different components which compose the coniferous forest. They are based upon

numerical proportions and not upon the timber volume, and include trees with basal diameters of 4 inches and upward. The tables are compiled for the purpose of indicating the proportions of the elements forming the established forest growth at the present time, within the dimensions specified. The numerical status of a species in the early stages of growth is determined in this region by its environments as regards shade, and by the multitudinous modifications and departures from the composition of the original growth on areas undergoing reforestations after fires. The numerical proportion of the forest components is never, in this region, a fixed matter. The older the stands, the less change there is in their composition up to a certain age limit, which varies with the life factor in the general duration of the species. For this reason were we to adopt a higher or a lower standard than 4 inches it would very materially change the proportions of the different species.

Relative proportions of coniferous species forming the forest on the western slope of the Cascades.

	Per cent.		Per cent.
Yellow pine.....	27.5	Noble fir.....	5.8
Sugar pine.....	2.8	Alpine fir.....	.2
White pine.....	.36	Western hemlock.....	.1
White-bark pine.....	.03	Alpine hemlock.....	6.5
Lodgepole pine.....	6.3	Engelmann spruce.....	.6
Red fir.....	44.	Incense cedar.....	.41
White fir.....	5.4		

Amabilis fir and Alaska cedar are two species which occur in the region, but are so few in numbers that they are quite inappreciable in the bulk of the forest.

From the above table it will be seen that two species, yellow pine and red fir, together constitute 71.5 per cent of the coniferous forest. It is generally supposed that the red fir is greatly the superior of all other species in this region. The contrary, however, is the case, the excess over the yellow-pine component being only 16.5 per cent. The cause lies entirely in the oft-repeated forest fires which sweep through these wooded areas. The seedlings and young trees possessing the greatest fire resistance survive, the others die. In its capacity to endure fire and survive the yellow pine is greatly the superior of all the other conifers in this region.

The large ratio of lodgepole pine is wholly owing to extensive fires in the subalpine areas, which have destroyed large and dense growths of alpine hemlock and noble fir, and have induced soil conditions exceptionally favorable to reforestation by lodgepole pine.

Sugar pine, white pine, Engelmann spruce, and incense cedar are species which have an extensive range, but do not reproduce themselves abundantly; hence the low ratio.

White-bark pine, alpine fir, and western hemlock are trees whose

range is circumscribed. The two former belong to the upper limit of the subalpine areas; the latter is of scattered occurrence in a few favorable localities, apparently, in this region, being near its southern limits.

Relative proportions of coniferous species forming the forest on the eastern slope of the Cascades.

	Per cent.		Per cent.
Yellow pine.....	68.	Noble fir.....	.5
Sugar pine.....	.9	Alpine fir.....	.02
White pine.....	.05	Western hemlock.....	Lacking.
White-bark pine.....	.01	Alpine hemlock.....	1.
Lodgepole pine.....	22.6	Engelmann spruce.....	.25
Red fir.....	1.22	Incense cedar.....	.75
White fir.....	3.7	Western juniper.....	1.

It will be noticed that the yellow pine easily ranks above all of the other species either singly or combined. The reason for this lies chiefly in the smaller annual precipitation on the subhumid areas of the western slope. The large proportion of lodgepole pine is chiefly due to forest fires. At least 90 per cent of the species owes its growth to this cause. The remainder occurs as the first forest covering on areas gradually being laid bare along margins of marshes and lakes by the lowering of their waters.

GEOGRAPHICAL DISTRIBUTION OF SPECIES.

With the exception of amabilis fir and Alaska cedar all of the conifers of the western slope are also represented on the eastern side of the Cascades; nor are they confined to the immediate eastern declivities of the range. With the exception of alpine hemlock, western hemlock, noble fir, and Engelmann spruce, they are found at many intermediate points between the Cascades and the Klamath-Deschutes divide, and it is not at all unlikely that further explorations may discover the four missing species on some of the subalpine elevations along that divide.

The yellow pine is the most widely distributed of the species. Occurring everywhere throughout the western slope within its altitudinal limit, it crosses the Cascades in a broad belt through Klamath Gap in Ts. 39 and 40 S. and in narrow scattered groves or in thin lines south of Lake of the Woods, in Ts. 38 and 37 S., following to Pelican Bay of Upper Klamath Lake the depression which exists between the Cascades main range and the group of high mountains west of Aspen Lake. Having reached the eastern base of the Cascades, the species follows the foot of the range northward to the southern boundary of the Klamath Marsh terrace, whence in a broad sheet it spreads out over the entire Upper Klamath Basin.

The sugar pine is more restricted in its range. Confined on the

western slope within narrower limits than the yellow pine, it crosses the Cascades through Klamath Gap. The distance between its eastern and western extensions in the Lake of the Woods depression is not more than 10 miles, and it is not impossible that scattered trees may occur in the short interval that separates the two. From where the sugar pine enters the Upper Klamath Basin through the gap it continues to extend northward, following closely the foot of the range and the lower edges of its middle elevations. In T. 33 S. it meets a southward extension coming from the Deschutes Basin. Heading the terrace of the Klamath lakes in T. 32 S., the sugar pine turns toward the south and follows the broken lava plateau which joins the volcanic areas around Swan Lake Point with those in the Cascades southeast of Mount Scott. A few miles southeast of Swan Lake Point the sugar pine thins out and disappears. Its next appearance in the Klamath Basin, within this region, is on the slopes of the Yamsay Range. It is here an offshoot from the mass of sugar pine which closely hugs the Klamath-Deschutes divide from its junction with the Cascades to some point in northern California outside of the area under consideration. From the Yamsay Range the species takes a southerly course to the region around Fuego Mountain in T. 33 S., and turning toward the east it becomes abundant enough to be reckoned as a factor in the mill-timber supply on the areas around the Black Hills in T. 34 S., Rs. 12 and 13 E. Continuing eastward it joins the stands of the species on the Klamath-Deschutes divide in the region of Gearhart Mountains.

The white pine is not a tree of plentiful occurrence on the west side of the Cascades. Beginning with the Siskiyou Mountains, it is found here and there on the higher slopes between Siskiyou Peak and Sterling Peak. Between its habitat here and its range in the southern areas of the Cascades is a wide gap. In the upper region of the basin of the South Umpqua the species is relatively abundant. From here it continues southward along the flanks of the Cascades, rarely extending more than 14 miles west from the summit, to the northern boundary of T. 39 S., R. 5 E., where it thins out and disappears. It crosses the Cascades in many localities between Diamond Lake and its southern limit in township 39, and extends down the eastern slope to the 5,000-foot contour line in many places. It is not found in the region of the Upper Klamath Basin within this area, but a few miles to the east in the Gearhart Mountains the species again appears.

The white-bark pine, being strictly a species of the upper limits of the subalpine areas, has a wide range, but is confined within narrow altitudinal limits. In the Siskiyou Mountains the species is nearly absent. A few score individuals in a group between Siskiyou Peak and Sterling Peak constitute all that were seen. Along the Umpqua-

Rogue River divide a few individuals were observed on the highest summits. The region of its greatest density is along the summit of the Cascades, where it forms the true timber-line tree on peaks like Mounts Pitt and Scott at elevations of 9,400 to 9,500 feet. In the interior of the Upper Klamath Basin it occurs on Yamsay Range and on high ridges in the Klamath-Deschutes divide.

The lodgepole pine is a species with a range which extends throughout the entire region examined. Strangely enough, it is not very plentiful either in the Siskiyou or in the Umpqua Mountains except where the latter range joins the Cascades. Its chief habitats are on the higher and summit areas of the Cascades, where it forms a very large proportion of areas reforested after fires, and everywhere in the interior of the Upper Klamath Basin, except on distinctly semiarid tracts.

The red fir is abundant on the western slopes of the Cascades, in the Siskiyou Mountains, and in the Umpquas between elevations of 2,500 and 6,200 feet. Below the 2,500-foot contour the growth is thin and scattering, but the species is never wholly lacking over any considerable area outside the distinctly semiarid, low-lying tracts. It crosses the Cascades through Klamath Gap and through the depression south of Mount Pitt in T. 36 S. On the eastern side of the Cascades it follows the foot and lower slopes of the range northward to the southern edge of the Klamath Marsh terrace. Here the growth is thin, the species occurring as low, gnarled individuals widely dispersed among the masses of yellow pine. The species does not extend northward from this point, but heading the north end of Upper Klamath Lake and turning eastward it follows the higher lava flows southward to the region around Swan Lake Point. On the eastern slopes of this peak the tree is fairly abundant, but of small dimensions. It thins out and disappears completely 4 miles south from Swan Lake Point, but reappears on the divides at the head of Lost River. It is not found elsewhere in the interior of the Klamath Basin, nor do I know of its occurrence on the Klamath-Deschutes divide.


The white fir occurs throughout all of the areas examined west of the Cascades below the 6,000-foot contour line. It crosses the range in many places between the canyon of Klamath River and Mount Pitt, but scarcely north of this peak. On the eastern slope it follows the range toward the north, and beyond the head of Upper Klamath Lake it spreads out over the entire forested area of the Upper Klamath Basin above elevations of 5,000 feet.

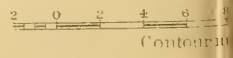
The noble fir is a species with its home chiefly among the higher elevations. It reaches its greatest dimensions at the lower levels of the subalpine forest. Within its proper altitudinal limits the species occurs everywhere on the areas west of the Cascades. It crosses the range freely, except in Klamath Gap, and on the eastern slope extends from 2 to 6 miles from the summit. The species is absent from the ranges in the interior of the Upper Klamath Basin.



PART OF SOUTHERN OREGON SHOWING DISTRIBUTION OF SUGAR PINE AND NOBLE FIR
 Prepared under the direction of H. H. Henshaw
 BY JOHN W. COOPER


 Sugar pine


 Noble fir



Contour interval 100 feet



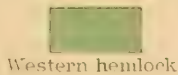
WESTERN HEMLOCK, NOBLE FIR, WESTERN HEMLOCK, INCENSE CEDAR

W. Gannett, Geographer in charge

BERG

0 10 20 MILES

700 Feet



Western hemlock



Incense cedar

The alpine fir is a tree of the high altitudes, and therefore is chiefly confined to subalpine areas. It occurs plentifully everywhere on the summit of the Cascades, less so on the Umpqua-Rogue River divide, while on the Siskiyou Mountains, so far as examined, it is nearly absent. I have no knowledge of its occurrence east of the Cascades in this region, except on the immediate declivities of the main range.

The western hemlock is found on the western side of the Cascades in scattered localities from Mount Pitt to Mount Thielsen, but nowhere very abundant. It is more plentiful on the northern slopes of the Umpqua-Rogue River divide than elsewhere. It is absent from the Siskiyou Mountains. In the region around the southern base of Mount Pitt scattering trees of the species cross over to the eastern side of the Cascades and form a small percentage of the forest at the south end of Lake of the Woods. The species is lacking in the Upper Klamath Basin.

The alpine hemlock is extremely abundant along the higher elevations of the Cascades and on the Umpqua-Rogue River divide. It freely crosses to the eastern side of the Cascades except through Klamath Gap, where the elevation dips below its altitudinal range. It is absent from the Siskiyou Mountains, so far as explored, with the exception of the northern slopes of Siskiyou Peak, where a few score individuals of the species were noticed. I have no knowledge of its occurrence anywhere in the interior of the Upper Klamath Basin, but there is a probability, at least, that it may be found along the highest points of the Klamath-Deschutes divide when that region shall have been explored.

Of the spruces, the only species represented in this region is Engelmann spruce. The tree is found in scattered bodies, mixed with other species, along the summit and in the canyons of the Cascades, both on the eastern and western slopes of the range. It is lacking in Klamath Gap for no apparent reason, as its altitudinal limit on the eastern side of the range is several hundred feet below the highest point in the gap. The species is lacking in the Siskiyou Mountains and on the Umpqua-Rogue River divide.

The incense cedar occurs in moderate abundance throughout the region of middle elevations on the western side of the Cascades, in the Siskiyou Mountains, and on the Umpqua-Rogue River divide. It crosses the Cascades through Klamath Gap, extends northward along the foot of the range to the Klamath Marsh terrace, whence it spreads out over the entire forested region of the Upper Klamath Basin.

The western juniper is of rare occurrence west of the Cascades in the Rogue River Basin. It is lacking on the Umpqua-Rogue River divide, likewise on the northern slopes of the Siskiyou Mountains, but is fairly common at low elevations on the southern declivities. East of the Cascades it occurs throughout the semiarid region comprised in

the Sprague River terrace, on the thinly wooded tracts at the eastern termination of Klamath Gap, throughout the semiarid regions of the Lost River drainage, and, in general, where the annual precipitation falls below subhumid ratios.

Among the broad-leaved species of the forest the most conspicuous are oak, madroña, and chinquapin. The two former are confined to the western slope of the Cascades; the latter occurs on both the eastern and western declivities, crossing the range in the region south of Mount Pitt. It is present along the Klamath-Deschutes divide, but only in a shrubby form or variety.

In the geographical distribution of the coniferous sylvas as outlined above, Klamath Gap apparently is a prominent factor in the interchange of species between the western and the eastern sides of the Cascades. It is not to be inferred from this that the gap is the only avenue through which species from the west found their way east, or vice versa. There are several other gateways through the Cascades in Ts. 37 and 38 S.; nor is it at all certain that the red fir, sugar pine, and other species of the Upper Klamath Basin originally came from the west through any of these gaps.

ALTITUDINAL DISTRIBUTION OF SPECIES.

Below 6,800 feet on the western slope and 7,000 feet on the eastern slope, including the Klamath Basin, there are no sharply drawn lines separating the altitudinal range of the various species. Above those elevations the elements of the sylvas are chiefly subalpine and the limits of their downward and upward extensions become more closely drawn.

The lower altitudinal limit for species on the eastern side of the Cascades is uniformly at a greater elevation than for corresponding species on the western side. This is due to the fact that isohyetal lines drawn from west to east through the Cascades will lie at a higher altitude on the eastern side than they do on the western. As the eastern slope has undoubtedly a lower mean annual temperature than the western it follows that the range of the species of coniferous trees indigenous to this region depends here more on moisture conditions than on temperature factors.

The principal limits in the altitudinal extensions of the various conifers are exhibited in the following table:

Altitudinal range of conifers in Cascade Range Reserve and adjacent region, Oregon.

WEST OF THE CASCADES.

Yellow pine.....	Between 1,300 and 6,000 feet, reaching its best development between 4,000 and 5,500 feet.
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Sugar pine	Between 3,000 and 5,000 feet, with greatest development between 3,500 and 4,500 feet.
White pine	Between 5,000 and 7,500 feet, reaching its best development along the line of the lower elevation.
White-bark pine	Between 6,000 feet and timber line, or 9,300 feet.
Lodgepole pine.....	Between 3,500 and 8,000 feet, some varieties reaching their best development at 4,500 feet, others at 7,500 feet.
Red fir	Between 2,500 and 6,800 feet, attaining its best and most abundant development between 4,000 and 5,800 feet.
White fir	Between 3,000 and 6,000 feet, its best development being between 4,500 and 5,500 feet.
Noble fir.....	Between 5,200 and 8,800 feet, with its greatest dimensions between 5,800 and 6,800 feet.
Alpine fir.....	Between 5,800 and 7,800 feet.
Western hemlock	Between 5,200 and 6,000 feet.
Alpine hemlock	Between 6,200 and 9,200 feet, or very close to timber line, its best development both as to numbers and dimensions occurring between 5,900 and 7,000 feet.
Incense cedar	Between 2,500 and 5,000 feet.
Engelmann spruce.....	Between 5,800 and 8,000 feet.
Western juniper.....	Between 1,600 and 5,200 feet.

EAST OF THE CASCADES.

Yellow pine.....	Between 4,000 and 7,000 feet, reaching its best development between 5,000 and 6,200 feet.
Sugar pine	Between 4,800 and 6,000 feet, with its best development along the 5,200-foot contour.
White pine	Confined to the immediate declivities of the main range at elevations varying from 5,500 to 6,000 feet.
White-bark pine	On the Cascade slopes and summits between 6,000 and 9,300 feet; in the interior of the Upper Klamath Basin between 7,800 and 8,500 feet, or to the top of the highest summits in that region.
Lodgepole pine.....	Between 4,200 and 8,500 feet, most plentiful and of largest dimensions along the 5,200 and 5,800-foot contours.

Red fir	Between 4,300 and 7,000 feet, in the interior of the Upper Klamath Basin not below 6,000 feet.
White fir	Between 4,000 and 7,500 feet, attaining its best development near the 6,000-foot contour.
Noble fir	Between 6,000 and 8,800 feet, confined in its range to the immediate slopes of the main range of the Cascades.
Alpine fir	Between 5,880 and 7,800 feet, its range not extending beyond the declivities of the Cascades.
Alpine hemlock	Between 6,000 and 9,200 feet, confined to the Cascades.
Incense cedar	Between 5,000 and 6,600 feet.
Engelmann spruce	Between 5,600 and 8,000 feet, limited in its range to a few of the larger canyons and wetter slopes of the Cascades main range.
Western juniper	From the lowest elevations to altitudes of 6,000 feet.

In the interior of the Klamath Basin none of the elevations reach timber line. In the Cascades Mount Thielsen, Mount Scott, and Mount Pitt have a true timber line irrespective of point of exposure along their slopes. The timber line on the southern slopes, where it is highest, is between the 9,300- and the 9,400-foot contour lines.

The timber-line tree is the white-bark pine. A hundred feet or so below its upper limit the alpine hemlock comes in, soon joined by the noble fir and alpine fir, with lodgepole pine and an Engelmann spruce here and there. White pine, red fir, white fir, incense cedar, and yellow pine in descending order complete the scale of coniferous growth, which on the western side of the Cascades ends in a fringe of oak and madroña, and on the eastern side in stands of western juniper.

If the interior of the Upper Klamath Basin possessed elevations of sufficient altitude to reach the timber-line limit there is scarcely any doubt but that the white-bark pine would form the timber-line tree here as well as in the Cascades. None of the Siskiyou peaks in the region explored reach timber line, nor were any found on the Umpqua-Rogue River divide west of its junction with the Cascades.

FOREST TYPES.

The elements or species which compose the forest are grouped and assembled in many different aggregations. These groupings may be considered under two aspects, viz, general or zonal aggregations, and limited or species groupings. The former is designated here as types, the latter as subtypes.

The term forest type, as here employed, is used to define large aggregations of one or many species of trees, usually comprised within definable territorial limitations.

The term subtype is applied to a multitude of lesser groupings of the species which form the type. Collectively they give to each type its characteristic features.

The composition of the forest types of any particular region is determined by the species of trees which form its *sylva*. As our forested regions consist of mountainous country the types have an upward as well as a downward and lateral extension. Climatic features, as developed by varying altitudes, are the dominant factors in limiting these extensions.

The subtypes being formed from the elements which compose the types are more or less repetitions of the larger and more general types on a smaller scale. The differences which make them definable as subtypes and serve as their dividing lines consist of varying percentages or ratios of the type species.

The composition of any particular subtype depends on many different factors. Some are natural processes, such as climatic and soil conditions, altitudinal endurance of the species, or its vegetative capacities. These are the fundamental ones. Through the agency of man the relative intensity of these factors often are changed temporarily over large areas, affecting the composition of the subtypes on such tracts. Through it all, however, there runs one general cause, operative at all times and in all places. This is the factor of mean annual, seasonal, or monthly soil humidity. It can be expressed in this way: Within isothermal and isohyetal lines the composition of the forest subtypes is determined by the ratio of mean annual soil humidity of the particular tract.

The duration of the forest type is indefinite. While undoubtedly subject to evolutionary changes, its modifications or transitions to other types are so slow as to be quite imperceptible to us. Not so with subtypes. They frequently change, sometimes two or three times in a generation. Forest fires are fertile causes for inducing such rapid changes. But even when left undisturbed a subtype rarely persists in any particular locality for more than 250 or 300 years. Such at least is the rule on the eastern and immediate western slope of the Cascades and in the basins between the Cascades and the Rocky Mountains. The only exception to this rule in the region named that is known to me occurs in pure yellow-pine and western-juniper growths.

In the region described in this report there exist three general forest types, viz, the yellow pine, the red fir, and the alpine hemlock.

YELLOW-PINE TYPE.

With reference to annual precipitation and mean ratio of soil humidity the yellow-pine type occupies the lowest position of all the forest types in the region. It is the dominant type throughout the Upper Klamath Basin. On the western side of the Cascades the type is not so well developed. Here it is chiefly found in the areas situated in Klamath Gap or adjacent to it, where the dry winds from the eastern side of the Cascades have free traverse and maintain the proper degree of soil humidity. West of the Cascades its altitudinal limits lie between 2,000 and 5,500 feet; east of the range they lie between 4,500 and 6,000 feet.

It is rarely an absolutely pure type: west of the Cascades it is never so; east of the range it sometimes runs pure to the extent of 99 per cent. Generally it is more or less mixed with varying percentages of white and red fir, incense cedar, and sugar and lodgepole pine. When the forest contains yellow pine to the extent of 50 per cent, it is here considered as belonging to the yellow-pine type (Pl. LXXV, *A* and *B*).

Illustrative examples of nearly pure yellow-pine types of forest east of the Cascades are T. 31 S., Rs. 10 and 11 E., where the forest is of the following composition:

Composition of forest in T. 31 S., Rs. 10 and 11 E., Oregon.

	Per cent.
Yellow pine.....	95
Lodgepole pine.....	4
White fir.....	1

Another example where the percentage of yellow pine is lower, but yet high enough to give the aspect of a nearly pure growth of yellow pine to the forest stands, occurs in T. 33 S., R. 10 E. The composition here is as follows:

Composition of forest in T. 33 S., R. 10 E., Oregon.

	Per cent.
Yellow pine.....	90.
Lodgepole pine.....	9.5
White fir.....	.5

The largest admixture of other species in the examples quoted above consists of lodgepole pine. This growth here represents thin stands around marshy places or fringes along creeks and seepy spots where the soil humidity is too high for a yellow-pine growth. Near the edges of the semiarid terrace of Sprague River in T. 34 S., R. 10 E., and in T. 35 S., R. 11 E., we find the purest expressions of the type. The composition of the forest in the first-named township is: yellow pine 98 per cent, lodgepole pine 2 per cent. In township 35 it is: yellow pine 99 per cent, western juniper 1 per cent. The small percentage of lodgepole pine in the former, and the nearly



A.



B.

YELLOW-PINE TYPE OF FOREST, NEAR JOHNSON PRAIRIE, WESTERN SLOPE OF CASCADES.

entire absence of associate conifers of any species in the latter is due wholly to a low ratio of soil humidity, the soil in both of these townships being loose and porous and a poor conservator of precipitation.

The yellow-pine type west of the Cascades, as already remarked, averages a smaller percentage of yellow pine in its composition than is the case east of the range. Rarely is it as high as 70, more often it is 60, and more frequently it falls below the standard here considered as representing the type. The following examples will serve to show the status of the yellow-pine type with reference to the percentage of the species and its associates:

Composition of forest in T. 36 S., R. 1 E., Oregon.

	Per cent.
Yellow pine.....	70
Red fir.....	5
Oak.....	25
Madroña.....	

This township is situated at the lowest forested levels on the edge of the semiarid portions of Rogue River Valley. Oak and madroña being able to endure a smaller ratio of soil humidity than the yellow pine, form, as will be noticed, a large percentage of the arborescent growth. T. 40 S., R. 3 E.; T. 40 S., R. 4 E.; and T. 40 S., R. 6 E. are situated within the influence of the dry-air currents drawing through Klamath Gap. All three of the townships carry a forest of the yellow-pine type. The composition is as follows:

Composition of forest in T. 41 S., R. 3 E., Oregon.

	Per cent.
Yellow pine.....	60
Red fir.....	35
Sugar pine.....	5
Oak.....	
Incense cedar.....	

Composition of forest in T. 40 S., R. 4 E., Oregon.

	Per cent.
Yellow pine.....	60
Sugar pine.....	8
Red fir.....	30
White fir.....	2
Incense cedar.....	
Oak.....	

Composition of forest in T. 40 S., R. 6 E., Oregon.

	Per cent.
Yellow pine.....	60
Sugar pine.....	15
Red fir.....	22
Incense cedar.....	3
White fir.....	

The composition of the forest in these three townships is a fair representation of the mixed character of the yellow-pine type west of the Cascades.

A comparison with the best examples of composite yellow-pine type east of the Cascades will show how completely the yellow-pine element dominates the type there. In the following two examples there are present the same component species that form the type in the two townships last quoted, with the exception of the small percentage of oak in T. 40 S., R. 4 E., which is lacking, and an addition of lodgepole pine.

Composition of forest in T. 36 S., R. 9 E., Oregon.

	Per cent.
Yellow pine.....	88
Sugar pine.....	.3
Lodgepole pine.....	4.7
White fir.....	3.5
Red fir.....	3
Incense cedar.....	.5

Composition of forest in T. 35 S., R. 9 E., Oregon.

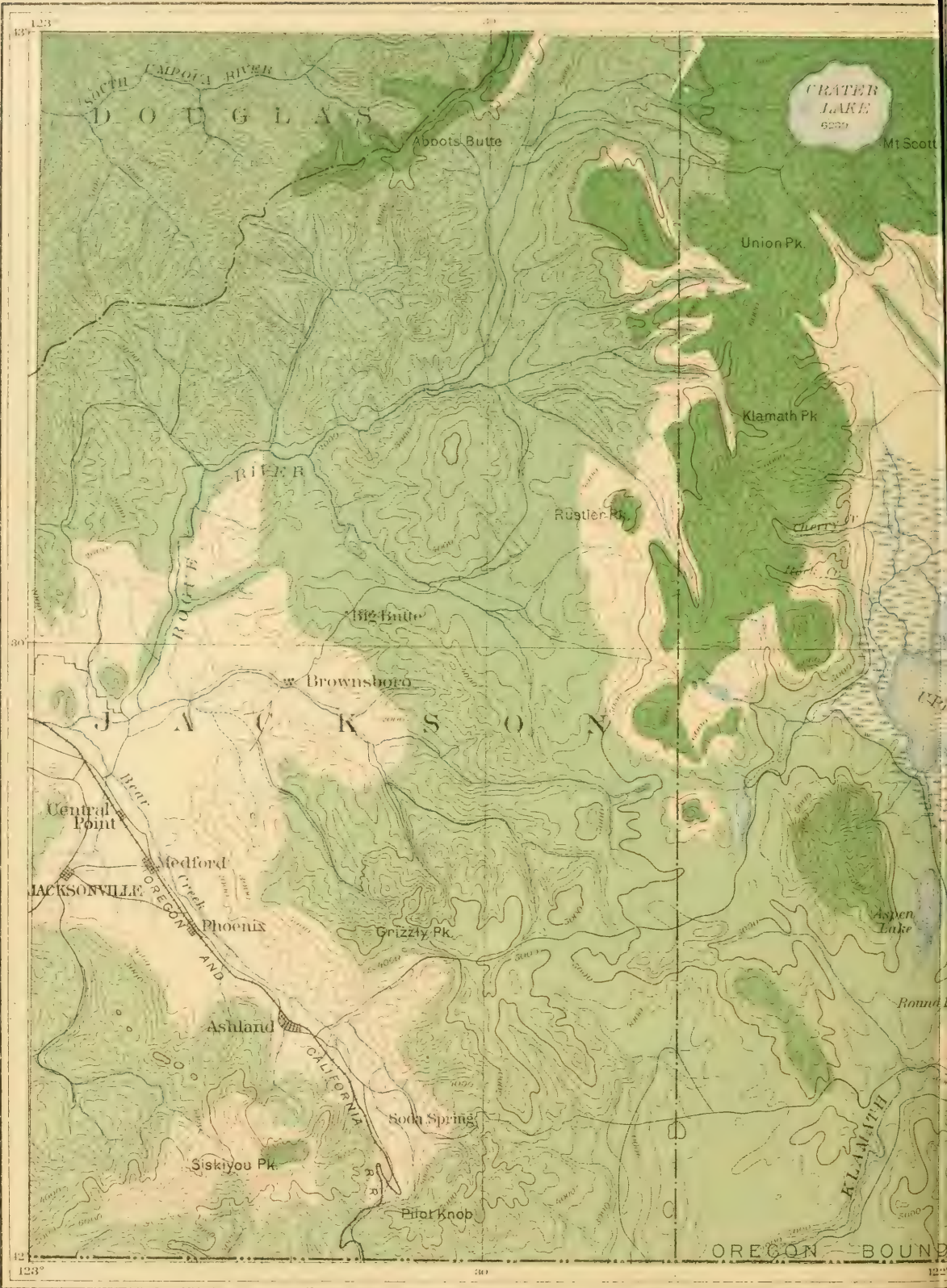
	Per cent.
Yellow pine.....	85
Sugar pine.....	.25
Lodgepole pine.....	12
White fir.....	.74
Red fir.....	2
Incense cedar.....	Trace.

If we now compare the acreage occupied by the yellow-pine type east and west of the Cascades the difference is no less striking, as may be seen from the following comparisons:

Comparison of areas occupied by yellow-pine type east and west of the Cascades.

	East of the Cascades.	West of the Cascades.
Total acreage of forested areas examined.....	1, 592, 700	1, 405, 740
Total acreage covered with forest of the yellow-pine type	1, 450, 420	330, 040
Percentage of acreage bearing yellow-pine type of forest.	94.2	23.5

The aspect of the type is that of an open forest with a minimum of undergrowth and seedling or sapling growth. The forest on the eastern side of the Cascades is more conspicuous in this respect than the forest on the western, owing to less variety in the frutescent flora of the former and, in general, to a smaller precipitation. But the open character of the yellow-pine type of forest anywhere in the region examined is due to frequently repeated forest fires more than to any other cause (Pl. LXXVII, A).



PART OF SOUTHERN OREGON SHOWING DISTRIBUTION OF RED FIR

Prepared under the direction of Henry G. Henshaw

BY JOHN B. COOPER

Scale



Contour interval


1896





DISTRIBUTION OF RED FIR AND ALPINE HEMLOCK
 Gannett, Geographer in charge
 1896

14 16 18 20 MILES
 feet


 Alpine hemlock

The forest floor in the type is covered with a thin layer of humus, consisting entirely of decaying pine needles, or it is entirely bare. The latter condition is very prevalent east of the Cascades, where large areas are annually overrun by fire. But even on the western side of the range, where the humus covering is most conspicuous, it is never more than a fraction of an inch in thickness, just enough to supply the requisite material for the spread of forest fires.

For lumbering purposes the type is the most valuable in the region, for the reason that it occurs in the most accessible situations and contains a maximum of the species commonly sawed, viz, yellow pine and sugar pine.

Freedom from fires insures a good and abundant reproduction of the forest type, whether east or west of the range. East of the Cascades its area is steadily increasing at the expense of tracts covered by the lodgepole pine. The process is slow, owing to fires. Were they kept down most of the lodgepole-pine areas on high ground would give way to pure or nearly pure growths of yellow pine. West of the Cascades the yellow-pine tracts in some places barely hold their own. Along their upper and higher limits there is occasionally a decided tendency toward a larger proportion of red fir as the coming forest. In the middle elevations of its range yellow pine is often found to have supplanted tracts of nearly pure red-fir stands. This shifting about is due chiefly to forest fires. On areas where yellow pine has replaced red fir there has been a decrease in the ratio of soil humidity necessary to the maintenance of the red-fir preponderance. The same condition has existed along the upper limits of the type where now red fir shows a coming ascendancy over the yellow-pine element, due to a return to higher soil-moisture ratios. Cases of yellow pine replacing red fir are common enough in the heavy red-fir growth in Ts. 30, 31, 32, and 33 S., R. 3 E., while the reverse is observable on all of the higher tracts in the yellow-pine townships situated in Klamath Gap.

YELLOW-PINE SUBTYPES.

Of the lesser and individual groupings or aggregations of the species which form the yellow-pine type, but one east of the Cascades deserves notice. The other subtypes are so thinly scattered among a preponderance of yellow pine that they are wholly lost sight of.

The subtype referred to is formed by pure or nearly pure growths of lodgepole pine. It might well be named the lodgepole-pine subtype. It occurs under two aspects. First, in the *contorta* form of the species; secondly, in the *murrayana* form. The aspect of the *contorta* form is that of dense masses of small, scraggy, limby trees forming a thick fringe along edges of marshes, creeks, or springy localities, or covering low, level areas, occurring in every case where the ratio of soil

humidity is too high to permit the growth of any other coniferous species indigenous to the region. The aspect of the *murrayana* form, in its ultimate development, is that of close or moderately open stands of tall, straight, slender trees covering well-drained uplands. This form of the subtype is in every case a reforestation after fires, in this region after stands of yellow pine. Between the two forms there are many gradations.

The characteristic feature of the subtype is its habit of forming pure growths. In this respect it stands preeminent among the coniferous species which make up the sylvia west of the Rocky Mountains and north of the California line. In this region these growths often cover large areas. The most conspicuous examples occur in Ts. 30 and 31 S., Rs. 7 and 8 E., where lodgepole-pine stands cover 40,000 acres out of a total of 48,000 forested, with a growth that averages 99 per cent pure.

The yellow-pine subtypes west of the Cascades consist of pure growths of the *contorta* form of lodgepole pine, aggregations of red fir and white fir in varying ratios, and groups of broad-leaved species mostly oaks and madroña.

The madroña rarely forms groups by itself. Usually it is scattered throughout otherwise nearly pure stands of yellow pine, where it forms a sort of undergrowth. Pure stands of small extent are met with in T. 39 S., R. 2 W., occupying the outer edge of the yellow-pine growth where it abuts upon semiarid areas. Frequently it forms a small percentage in oak copses scattered throughout the yellow-pine tracts.

The two species of oak peculiar to the region often constitute the larger percentage of arborescent growth on the lower areas of the yellow-pine forest. They form open growths, sometimes with a great deal of underbrush composed of *Ceanothus cuneatus* and other ceanothi, service berry, hawthorn, and the like; at other times the oak stands are entirely free of undergrowth of any sort. The more open oak growths, where they form a fringe between the yellow pine and the nonforested semiarid tracts of Rogue River Valley are from 95 to 100 per cent pure growths. At higher elevations with greater ratios of precipitation and soil moisture they run from 40 to 60 per cent oak, the balance consisting of pine and fir or of madroña and other species of broad-leaved trees.

The lodgepole-pine subtype is infrequent in the strictly yellow-pine type of forest. It is lacking in the Siskiyou Mountains, so far as examined, but occurs in the Umpqua Range and along the upper limit of the yellow-pine type on the Cascades slopes. As before remarked, it is invariably of the *contorta* form, and, like its prototype east of the Cascades, it is always found as a fringe of arborescent growth along the edges of marshy or springy places.

The subtypes formed by aggregations of red and white fir are more



A. YELLOW-PINE TYPE OF FOREST, EAST SIDE OF WILLIAMSON RIVER, UPPER KLAMATH RIVER BASIN.



B. BURNT YELLOW PINE, ROGUE RIVER VALLEY, NEAR MILL CREEK.

common and characteristic than any of the others. They are scattered almost everywhere throughout the stands of the type. They are never singly of large extent, from a half acre to one acre being an average size. The ratios in which the species occur are greatly varied, but the following proportions predominate in the majority of instances:

Proportion of species composing yellow-pine subtype of forest.

1.		Per cent.	3.		Per cent.
Red fir.....	60		Red fir.....	50	
White fir.....	35		White fir.....	50	
Yellow pine.....	5				
2.			4.		
Red fir.....	35		Red fir.....	80	
White fir.....	45		White fir.....	20	
Yellow pine.....	20				

The development of subtypes with these compositions in the general yellow-pine type of forest, and their capacity to maintain their relative species ratio until maturity is due solely to the presence of the required degree of soil humidity on the particular tracts that they occupy throughout the seasonal changes of the year. The subtypes occur, as a rule, in or along hollows or depressions in the general level, on northern slopes, or on low inequalities of the ground, in short, where the required degree of soil moisture exists. Neither the presence nor absence nor relative abundance of seed trees of the species on adjacent areas has any influence upon the formation of these subtypes or aggregations. Nor do the tolerance ratios of the different elements that compose them operate in any way to change their composition between the sapling and the veteran stage.

Of the other elements which constitute the yellow-pine type the most prominent are the sugar pine and the incense cedar. They rarely form any considerable groups or aggregations together or singly, being found mostly as scattered trees among the other species. The reproductive capacities of the two species appear to be much inferior to those of the other conifers that make up the yellow-pine forest type, which partly accounts for their relative scarcity, but in addition some causes not understood undoubtedly operate in limiting the increase in volume and numbers of these species.

RED-FIR TYPE.

The red-fir type of forest occupies areas generally situated at higher elevations than those of the yellow-pine type, hence these areas have considerably greater precipitation and soil humidity. The lower limits of the type adjoin the upper boundaries of the yellow pine; the upper limits encroach upon forest conditions belonging to subalpine types.

The red-fir type is not well represented on the eastern side of the Cascades, although it is by no means wholly absent. On the western side it is the dominant type. Its altitudinal limits on this side of the range lie between the 3,800- and 6,200-foot contours. Its altitudinal range on the eastern side is between 5,500 and 6,500 feet, and it is confined to the immediate slopes of the main range of the Cascades and to those of the secondary range between Upper Klamath Lake and the Cascades.

The red-fir type is never a pure type here. In not a single place in the entire region were as much as 200 acres carrying a pure growth of red fir found in one body. While the red-fir component often overwhelmingly outnumbers all the other elements in any particular stand there always is a sufficient quantity of the other species present to make the admixture conspicuous. The small pure growths of yellow pine so frequent and noticeable in the yellow-pine type are missing from the red-fir forest.

The component elements of the red-fir type of forest are: Yellow, sugar, white, and lodgepole pine; red, white, and noble fir; western hemlock; Engelmann spruce; and Pacific yew. The ratios in which these species occur vary with altitude. Along and between the 5,300- and 5,900-foot contours the red fir predominates. Below these line are found greater quantities of the species characteristic of the yellow-pine type, while above occur species more or less closely identified with the alpine-hemlock type.

The percentage of red fir in stands of the type varies from 50 per cent, which here is considered the lowest ratio for stands representative of the type, to 75 and in some cases to 85 per cent. A characteristic stand, and one which is typical of much of the red-fir forests of the region, contains about 60 per cent of red fir, the balance being made up of varying ratios of white fir, sugar pine, yellow pine, and occasional trees of incense cedar.

As exhibiting the composition of the red-fir forest type the following examples may be cited:

Composition of forest in T. 32 S., R. 1 W., Oregon.

	Per cent.
Red fir	70
White fir	8
Yellow pine	20
Sugar pine	} 2
Incense cedar	

This township is situated along the summit and higher slopes of the Umpqua-Rogue River divide, in a region where the red-fir forest is generally heavy and of tolerably uniform composition. It is a reforestation after an extensive fire which burned about one hundred and twenty years ago, and the red-fir component is as yet below standard with reference to its average height and diameter.

Coming nearer to the main range of the Cascades we find a few town-

ships covered with a massive red-fir growth of great age, and fairly representative of the best and ultimate development of the type in this region. They have suffered comparatively little from modern fires and the forest has been permitted to adjust its composition without the interference of man. The townships referred to and the compositions of their forests are as follows:

Composition of forest in T. 32 S., R. 3 E., Oregon.

	Per cent.
Yellow pine	9
Sugar pine	22
White pine	1
Lodgepole pine	1
Red fir	60
White fir	6
Western hemlock .....	.5

Composition of forest in T. 33 S., R. 3 E., Oregon.

	Per cent.
Yellow pine	2
Sugar pine	12
White pine .....	.2
Red fir	75
White fir	10
Western hemlock .....	.2
Incense cedar .....	.1

Composition of forest in T. 34 S., R. 3 E., Oregon.

	Per cent.
Yellow pine	15
Sugar pine	5
Red fir	60
White fir	18
Western hemlock .....	.5
Incense cedar	1

As exhibiting the composition of the red-fir type at lower elevations, or where humidity conditions approach those which determine the yellow-pine type, the following may be taken as representative:

Composition of forest in T. 35 S., R. 2 E., Oregon.

	Per cent.
Yellow pine	30
Sugar pine	1
Red fir	55
White fir	5
Incense cedar	2
Oak	7

Composition of forest in T. 40 S., R. 1 W., Oregon.

	Per cent.
Yellow pine	25
Sugar pine	5
Red fir	55
White fir	5
Incense cedar	2
Oak and madroña	8

Along the upper altitudinal limits of the type are found small percentages of trees belonging to the alpine-hemlock type. They replace, in a large degree, the yellow and sugar pine components of the middle and lower elevations. Examples of this aspect of the type occur, among others, in the following townships:

Composition of forest in T. 37 S., R. 4 E., Oregon.

	Per cent.
Yellow pine .....	.2
White pine	6
Lodgepole pine.....	.8
Red fir	64
White fir	18
Noble fir.....	10
Engelmann spruce.....	.8

Composition of forest in T. 30 S., R. 2 E., Oregon.

	Per cent.
Yellow pine	10
Sugar pine	3
White pine	2
Red fir	68
White fir	6
Noble fir.....	11

Examples of this kind are not common in this region. The tendency of the red-fir type here is always toward added or greater ratios of the species requiring less moisture for their growth. In other words, throughout the region examined west of the Cascades there is everywhere a clearly marked extension of the yellow-pine type elements into the areas of the red-fir type, where they are slowly but surely supplanting the species that need a high degree of soil and atmospheric humidity with species which require a smaller ratio of these factors of growth.

As already mentioned, the red-fir type is not common east of the Cascades in the Upper Klamath Basin. The only localities where it is at all well developed are the Lake of the Woods depression and some of the areas draining into Klamath Gap. The townships noted below are examples of the aspect which the type assumes here:

Composition of forest in T. 40 S., R. 7 E., Oregon.

	Per cent.
Yellow pine	40
Sugar pine	5
Red fir	55

Composition of forest in T. 39 S., R. 6 E., Oregon.

	Per cent.
Yellow pine.....	31
Sugar pine	7
Red fir	50
White fir	10
Incense cedar	1

If the yellow-pine type is the dominant one east of the Cascades, the red-fir type is no less so west of the range. The following statement exhibits the comparative status of the type in the two sections:

Comparison of areas of red-fir type east and west of the Cascades.

	East of the Cascades.	West of the Cascades.
Total acreage of forested areas examined	1,592,700	1,405,740
Total acreage covered with forest of the red-fir type...	58,580	817,840
Percentage of acreage bearing red-fir type of forest	3	58

From the foregoing it will be seen that the red-fir type, while the dominant one west of the Cascades, is very far from assuming the proportions that the yellow-pine type does on the eastern side of the range.

In the red-fir type the forests in these regions reach their maximum density. This holds good for the mature timber as well as for the seedling and sapling growth. The type never has the open aspect which characterizes stands belonging to the yellow-pine type. Except on areas where heavy stands of mature timber effectually shade the ground there is a good undergrowth of many species of shrubs.

Humus and litter in stands of the type are moderately abundant. On ground where fires have not run for one hundred to two hundred years humus covers the forest floor to a depth which varies from 3 to 5 inches. The litter consists of broken trees and branches. It is enormously increased in quantity when a fire, even of low intensity, sweeps through the forest.

Reproduction of the red-fir type is good, but the relative ratio of the various species which compose it are subject to many changes. I should say that the red-fir species is, on the whole, assuming minor proportions in the general composition of the type, giving way chiefly to increasing percentages of yellow pine and white fir. The change is slow and gradual, but is steadily progressing, at least on areas of low elevation along the upper limits of the yellow-pine type. While it may not be possible to prove in a conclusive manner that climatic changes are responsible for the gradual restriction of the red fir, it is at least clear enough that the gradual deepening of the numerous drainage channels which intersect the red-fir areas lessens the soil moisture in the intervening blocks of ground by a more thorough and greatly accelerated outflow, and thus prepares the way for species of more subhumid tendencies than the red fir. This phenomenon is plainly visible everywhere throughout the stands of the type. Changes of this sort are too slow, however, to affect the present status of the type. We may therefore say that on areas undisturbed by forest fires the red-fir type practically holds its own, with the red-fir species as

the leading component. Where fires have ravaged the stands, the red fir will come again as the primary and principal seedling growth, provided the fire was one of low or moderate intensity. Where the stands have been totally destroyed or the destruction amounts to 75 per cent and upward red fir may come as the chief growth if the local seepage is sufficient to maintain the requisite degree of soil humidity. If this is not the case, we have reforestations where the chief components are yellow pine or white fir, or sometimes lodgepole pine of the *murrayana* form.

There are cases observable in many localities along the upper limits of the yellow-pine type where stands of red fir are slowly replacing yellow pine. These are not due to extensions of red-fir areas, but are merely cases in which the red fir is again asserting its supremacy on tracts whence it was driven by forest fires long ago (Pl. LXXVIII).

RED-FIR SUBTYPES.

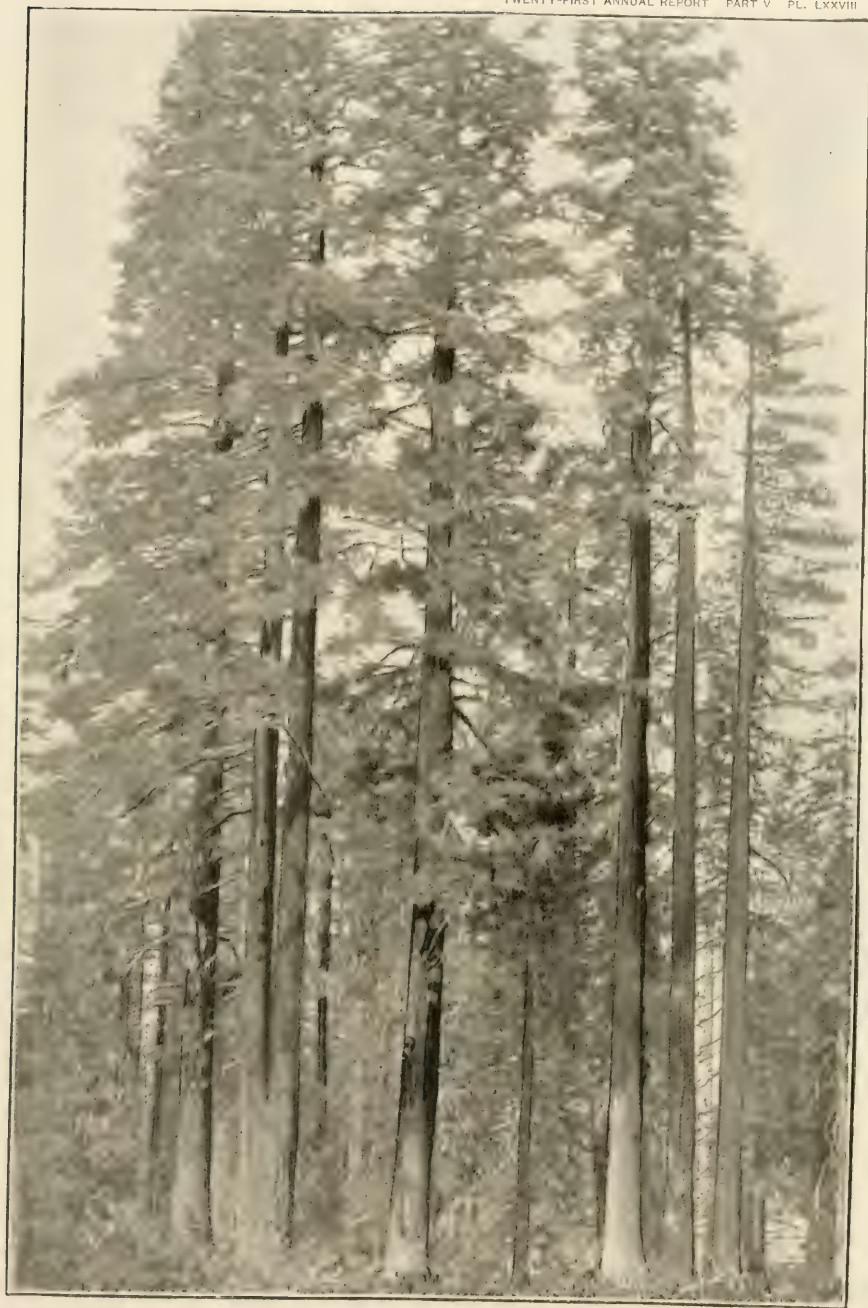
The lesser groupings of the species which form the general red-fir type are very numerous, but mostly of small areal extent in any one locality. The most common subtype in our region is one in which white fir forms the chief component. In every case the ascendancy of this species can be traced to the effect of forest fires. The most conspicuous example of the white-fir subtype occurs in T. 37 S., R. 5 E., where the composition of a forest of undoubted red-fir type is as follows:

Composition of forest in T. 37 S., R. 5 E., Oregon.

	Per cent.
Yellow pine	1
Lodgepole pine.....	3
Red fir	8
White fir	88

This white-fir growth is a reforestation after a fire which a hundred years ago destroyed a forest where red fir largely predominated, as is seen in the number of very aged trees of this species remaining in the later growth of white fir.

Small groupings in which the white fir forms fully as large ratios as in the locality cited above are found in many places throughout the red-fir type. It is rare, however, to find the white-fir stands maintaining their numerical superiority into maturity. It is more often the case that a white-fir stand or reforestation which starts in the seedling stage with a ratio of 70 to 80 per cent has dwindled by the time it has reached a well-advanced sapling stage to a ratio of 20 to 35 per cent of white fir, the balance being red fir principally. Were it not so two or three generations of successive forest fires would have wiped out of existence most of the red fir in this region. The stands of the white-fir subtype furnish in their numbers, extent, and ratios



GROUP OF RED FIRS, ROGUE RIVER VALLEY, NEAR MILL CREEK.

of composition unfailing guides for the estimation of the extent and age of fires in the red-fir type before the advent of the white man.

The yellow pine occasionally forms stands and becomes a subtype. We may consider it a subtype on the grounds that on the areas here in view it is a temporary reforestation after fires, and while the particular stand may grow to a sort of "immature" maturity it will not reproduce itself in a preponderating ratio. Subtypes consisting of 60 to 80 per cent yellow pine surrounded with dense red-fir growths on the same level are found in many places. Good examples occur in the massive, veteran red-fir growths in the Rogue River Valley, in Ts. 31 and 32 S., R. 3 E. Here yellow-pine reforestations have reached maturity, are in a state of decay, and are gradually being replaced by red fir, which advances from the surrounding forest to close the gap.

The sugar pine never forms stands of pure growth, nor does it ever exist among other groups in preponderating or large ratios. It is a tree that, whatever may have been the case in past times, is now decidedly deficient in reproductive capacity in this region. It therefore exists as scattered trees among the mass of red fir and other species of that type.

The lodgepole-pine subtype occurs only in the *contorta* form of the species. It is common on the slopes of the Cascades, less so on the Umpqua-Rogue River divide, while on the Siskiyou Mountains it is rare or wholly lacking in most places. Its habitat is around the edges of swamps and generally on ground too wet to permit other species of conifers to flourish, but not too wet for arborescent growth. The proportion of the species always runs high in stands of this character, seldom less than 95 per cent, the remainder consisting of poplar and cottonwood or species of willow and thorn.

The white pine rarely occurs in sufficient numbers to form stands distinguishable as subtypes. It is mostly found scattered throughout mixtures of red and white fir in the middle and upper areas of the red-fir type. Exceptions occur, however. In T. 37 S., R. 5 E., in the space between Mount Pitt and Mount Brown, is a tract of about 2,000 acres on which white pine forms 70 per cent of the forest. It is a growth 70 or 80 years old—a reforestation after forest fires. But as a rule the white pine forms a proportion varying from 2 per cent down to scattered trees in stands of composite red-fir type. It is an open question whether the species is maintaining its present general ratio in the forests of red-fir type in the region. I should say that south of the Umpqua-Rogue River divide, where the stress of advancing semi-arid and subhumid conditions is more marked than north thereof, the species is losing ground. Its reproductive capacity here is certainly poor. The number of veterans and standards throughout the forest is greater than the sapling growth of the species. North of the Umpqua-Rogue River divide the species becomes more abundant, and

its upper altitudinal limits, with mill-timber dimensions, is, for some reason, considerably increased. We find it, for example, in T. 28 S., R. 5 E., at altitudes of 7,000 feet, in the subalpine forest, with diameters up to 30 inches and 150 to 175 feet in height, rivaling the best growth of the species at elevations of 5,500 feet in the central areas of the Rogue River Basin.

The noble fir is plentiful in numerous localities along the upper areas occupied by the red-fir type. Occasionally its ratio is sufficiently large to mark it as a subtype. In such cases the composition of the stands of which it forms the preponderating element are as follows: Red fir, 6 per cent; white fir, 10 per cent; noble fir, 83 per cent. An example like this is an extreme case, however, and is only found where the red fir has been burned out and the noble fir has come in as a reforestation. More frequently the percentages of the different species stand as follows: Red fir, 25 per cent; white fir, 20 per cent; noble fir, 55 per cent.

The best specimens of the noble-fir subtype in forests of red-fir type are found in T. 37 S., R. 5 E.; in Ts. 34, 35, and 36 S., R. 4 E., along the 5,400-foot contour line. There also are excellent examples of the subtype in T. 34 S., R. 6 E., east of the Cascades, on the glaciated plateau south of Cherry Creek; a habitat where the species exists under the stress of the subhumid conditions prevalent east of the range. The average ratio of the species in its relation to the entire mass of the red-fir type is, approximately, 0.001 per cent. Apparently it maintains this ratio, but there is no clear evidence of its extensions in the red-fir type beyond these figures.

The western hemlock occurs sparingly in the red-fir type, and chiefly as scattered individuals in the wetter and shadier localities in the habitats of the type. Occasionally small areas are covered with nearly pure aggregations of the species and a stand with subtype characteristics is formed. In Ts. 30 and 31 S., R. 4 E., are found such aggregations. They are limited to the trough of Union Creek, and comprise altogether but 500 or 600 acres. The percentage of western hemlock in these stands varies from 60 to 80 per cent. Similar stands occur on the banks of the North Fork of Rogue River in T. 30 S., R. 3 E., and north of the Umpqua-Rogue River divide, in Ts. 29 and 30 S., R. 2 E. The species is clearly diminishing in numbers in this region so far as its ratio as an integer in the red-fir type is in question. Nor is there any evidence of its extension into the subalpine forest type.

The Engelmann spruce is of rare occurrence as a factor in the red-fir type. Only occasional trees, scattered here and there along the upper limits of the type, are met with. This species also is one whose complete elimination from the red-fir type is here only a matter of a comparatively short period of time.

In its arborescent form the Pacific yew occurs as scattered trees only, forming an insignificant portion of the type. In its semiarborescent aspect, which is its usual mode of occurrence in this region, it sometimes is exceedingly abundant. The most remarkable example of this kind which came under my observation occurs in T. 38 S., R. 4 E., where, in a mixed growth of veteran red fir, white fir, and white pine, the Pacific yew, in a subarborescent form, constitutes an almost impenetrable undergrowth, and, numerically, is far ahead of the strictly arborescent components of the forest stand.

ALPINE-HEMLOCK TYPE.

The subalpine areas of the region—that is, such as generally lie above 6,200 feet on the western slope of the Cascades and above 6,500 feet on the eastern—are covered with forests of the alpine-hemlock type. It thus occupies the areas having the highest ratios of precipitation and soil humidity within limits of like conditions of seepage.

While the elevation boundaries for the type given above are the general and governing ones in this region, it is not absolutely confined within those lines. On northern slopes the type sometimes dips below the 5,800-foot contour line, and it may occasionally follow the deep and shady canyons of streams even lower.

The type occurs throughout the entire length of the main range of the Cascades on both slopes, at intermittent points along the summit of the Siskiyou Mountains, and at many points on the crest and highest slopes of the Umpqua-Rogue River divide. In its southward extension to the Sierra Nevada there is a gap, about 12 or 14 miles wide, where Klamath River breaks through the Cascades, in which area the type is lacking. East of the Cascades, in the Upper Klamath Basin, the type occurs on the summit of the Yamsay Range, on the Gearhart Mountains, and doubtless at other points along the highest elevations of the Klamath-Deschutes divide.

On small areas the alpine-hemlock type is frequently pure—that is to say, composed entirely of alpine hemlock. On larger areas the type forms stands in which the same species prevails to the extent of 75 to 85 per cent. The few species of conifers which thrive at the usual altitudes of the type make the chances for stands of pure growths far more numerous and certain than is the case among the lower altitude types with their more complex composition.

The species which form the integral parts of the alpine-hemlock type of forest are: Lodgepole, white, and white-bark pine; noble and alpine fir; alpine hemlock; and Engelmann spruce. With the exception of the white and white-bark pine and Engelmann spruce, the ratio in which the species exist in the type is largely a matter of chance. Forest fires of modern date have so thoroughly destroyed the old forest that most of the growths of the type are merely refor-

estations of no great age. What the relative ratio of the species belonging to the type would be on any large area undisturbed by fire for a century or more, there are no means of knowing, although it is hardly to be doubted that the alpine hemlock would show a preponderating ratio.

The general ratio of alpine hemlock in the composition of the type is approximately 50 per cent as regards numbers of individuals, and 60 per cent if reference be had to the timber volume. The species which crowds it most closely as to numbers is the lodgepole pine, but it is much inferior to the hemlock in timber volume. Typical alpine-hemlock forests contain 60 to 80 per cent of the species. Such growths are especially plentiful in the region between Crater Lake and Mount Pitt. The following examples are fair specimens of the alpine-hemlock type of forest:

Composition of forest in T. 32 S., R. 5 E., Oregon.

	Per cent.
Lodgepole pine	15
Noble fir	12
Alpine fir	2
Alpine hemlock	70

Composition of forest in T. 31 S., R. 5 E., Oregon.

	Percent.
Lodgepole pine	40
Noble fir	3
Alpine hemlock	56

Composition of forest in T. 33 S., R. 5 E. Oregon.

	Per cent.
Lodgepole pine	3
Noble fir	12
Alpine hemlock	85

These ratios are for areas comprising entire townships situated along the summit and highest slopes of the main range of the Cascades.

For comparison the central portion of T. 30 S., R. 1 E., situated on the Umpqua-Rogue River divide is cited. Its composition is as follows: Noble fir, 20 per cent; alpine hemlock, 79 per cent.

Along the lowest altitudes of its range the type is of a more composite character, as may be seen from the following example, which comprises areas situated almost wholly below 6,800 feet:

Composition of forest in T. 34 S., R. 4 E., Oregon.

	Per cent.
Lodgepole pine	11
Noble fir	21
Alpine fir	2
Alpine hemlock	50
Engelmann spruce	16

The highest limits for the alpine-hemlock type are the timber lines, varying from 8,000 feet on northern slopes of the highest peaks to 9,500 feet on southern declivities. Along the edge of extreme timber line alpine hemlock is wanting and white-bark pine reigns supreme, but 100 feet below the upper limit of this species alpine hemlock comes in and soon gains the ascendancy. The following examples, all taken from southern declivities, are illustrative:

Composition of forest at various altitudes on Mount Pitt, Oregon.

	Per cent.
Timber line:	
White-bark pine.....	100
300 feet below timber line:	
White-bark pine.....	50
Alpine hemlock.....	50
800 feet below timber line:	
White-bark pine.....	2
Alpine hemlock.....	88
Noble fir.....	10

East of the Cascades, in the Upper Klamath Basin, the alpine-hemlock type of forest is poorly developed. Almost its only constituent species is the white-bark pine, and the acreage covered by it is small.

At the present time the type is losing ground, in so far as the preponderance of the alpine-hemlock is in question. This is wholly due to forest fires which, wherever they burn in the subalpine elevations below 7,800 feet, are followed by reforestations in which the lodge-pole-pine element prevails from a ratio as high as 60 per cent to total. The suppression of the hemlock through this cause is doubtless only temporary, although a century or two may elapse before it completely re-covers the lost ground.

The areas occupied by forests of the alpine-hemlock type in the region examined are of much greater extent on the western side of the Cascades than on the eastern. The following comparative statement exhibits the acreage of each of the two slopes:

Comparison of areas of alpine-hemlock type on the east and west sides of the Cascades.

	East of the Cascades.	West of the Cascades.
Total acreage of forested areas examined.....	1,592,700	1,405,740
Total acreage covered with forests of the alpine-hemlock type.....	83,700	257,860
Percentage of acreage bearing alpine-hemlock type of forest.....	5.5	18.3

By comparing these figures with the ratio of acreage covered with yellow-pine type of forest it will be noticed that on the western side

of the Cascades the areal differences between the two types amounts to only 5.2 per cent in favor of the yellow-pine type. While these ratios apply only to the Rogue River Basin in the Cascades, and to the Upper South Umpqua Basin, I have little doubt they will be found to apply equally well to the western slope of the Cascades as far north as the McKenzie Fork of the Willamette.

The aspect and density of the alpine-hemlock type of forest vary exceedingly according to age and altitude, far more so than either the red-fir or the yellow-pine types. At high elevations a mature forest of the type consists of low, stunted individuals, set well apart. At middle altitudes the type is usually open and park-like when well advanced in age, the alpine-hemlock component being most frequently collected in groups with individuals of white pine and noble fir scattered throughout. At its lower altitudinal limits well-preserved examples of the type often present magnificent examples of forest growth but little inferior in timber volume to the best stands of the red-fir type. In such cases the type is almost wholly composed of alpine hemlock and noble fir; the trees stand 20 to 30 feet apart with long columnar trunks, and run from 100 to 200 mature trees to the acre. Stands of this kind occur on the northern slopes of the Umpqua-Rogue River divide, and in the Cascades at the head of the Middle Fork of Rogue River. They are never of any very large extent, most of them having been ruined by fire long since.

Stands of seedling, sapling, and middle-aged growth of the type are often exceedingly close set. From 4,000 to 10,000 trees to the acre in stands 20 to 40 years old are of common occurrence. Younger growths are set even closer.

The quantity of humus and litter in forests of the type depends largely upon the factor of forest fire. In old stands at middle elevations that have long enjoyed immunity from fire there is very little litter. If the situation is in the bottom of a valley there will be an accumulation of humus 3 inches to 4 inches in depth, but on the punice-covered slopes and summits of the Cascades, even in the best-preserved stands, there is never much humus on the forest floor. In stands that have been exposed to devastation by fire the litter is usually abundant, consisting of the common débris of a partially burned forest, broken and charred trunks and limbs, dead trees still standing, and great numbers of them overthrown by wind and snow. There is no humus in such places, the deposit having been burned up in the fire.

Reproduction of the type in a broad way is good, but if examined in a special manner, with reference to its component species, the stability of the type on the ratio here adopted as its distinctive character is not promising. Neither the alpine hemlock nor the noble fir are holding their ground against the overwhelmingly great increase in the lodge-pole-pine component following fires. If this species continues to

extend its limits and ratios for the next forty years as it has done in the last forty or fifty years the alpine-hemlock type of forest in this region will be transformed into one consisting exclusively of pure lodgepole pine.

ALPINE-HEMLOCK SUBTYPES.

Among the aggregations or subtype groupings of the component species which form the alpine-hemlock type there are three frequent enough and covering areas sufficiently large to assume especial prominence. They are groupings in which the alpine hemlock, the lodgepole pine, and the white-bark pine each constitute 90 per cent or more of the total number of individuals in the association.

The lodgepole-pine subtype is the most conspicuous. It is composed of the *murrayana* form of the species, and invariably is a reforestation after fires. Its great development after fires indicates that, temporarily at least, the ratio of soil moisture has been reduced below the point where the growth of alpine hemlock and noble fir in any great numbers is possible. The subtype occurs in many localities on the summit and along the upper slopes of the Cascades on both sides of the range; it is especially common throughout the pumice-covered tracts, because the upper foot or two of soil made up of this material parts quickly with its moisture when exposed to the sun, and seed of other species of conifers than the lodgepole pine fail to germinate on the dry soil. In the Siskiyou Mountains the subtype is lacking, and along the Umpqua-Rogue River divide, except where it joins the Cascades, it is of small extent. In the Cascades the most conspicuous examples of the subtype occur in the region between Mount Thielsen and Union Peak. The following examples will serve to show its extent and composition in that region:

Composition of forest in T. 28 S., R. 6 E., Oregon.

	Per cent.
Lodgepole pine.....	95
Noble fir.....	3
Alpine hemlock.....	2

Composition of forest in T. 29 S., R. 5 E., Oregon.

	Per cent.
Lodgepole pine.....	92
Noble fir.....	2
Alpine hemlock.....	6

These tracts are situated on the summit and high slopes of the main backbone of the Cascades and comprise two entire townships. South of Crater Lake and extending to the northern base of Union Peak are scattered tracts aggregating thousands of acres on which lodgepole pine has replaced alpine hemlock and noble fir with stands running 99 per cent lodgepole pine.

The groups of this species in the alpine-hemlock type are destined to vanish in time, provided forest fires are absolutely kept down. At the present time they are on the increase, partly owing to recurring fires now in lodgepole stands, now in previously unburned alpine-hemlock and noble-fir growths, and partly owing to reforestations of grassed-over tracts which long ago were denuded of their forest cover by fire. At high altitudes in the Cascades a return to forest conditions of such areas is nearly always accomplished by an initial growth of lodgepole pine.

Subtype groupings of the white-bark pine are infrequent and of small extent. They occur chiefly at, or a short distance below, the timber line on a few of the highest peaks in the region. As a rule the species is thinly scattered through mixed stands of alpine hemlock and noble fir above 7,000 feet.

Subtype groupings or pure-growth stands of alpine hemlock are not infrequent along all the higher elevations of the Cascades. On the Siskiyou Mountains they are lacking, and on the Umpqua-Rogue River divide they are, collectively, of limited extent. They are especially characteristic of stands in which the species has attained middle age or maturity. The pure growths of alpine hemlock are distinguished also by another peculiarity, that of forming associations of ten to twenty-five individuals which stand so close that apparently they all spring from a common root. These small aggregations are extremely characteristic of the habit of the species at the middle and upper altitudinal limits of its growths. Numbers of these associations, more or less closely grouped together, form a shade so dense that the other component species of the alpine-hemlock type stand little chance of growth in such places. We have, therefore, pure growths of the alpine hemlock. At lower elevations, or in reforestations after fires, the alpine hemlock rarely forms these small associations, and in consequence the growth is much mixed with other species.

The cause of the small, close groupings of the species which are so noticeable and striking is not wholly clear. Apparently many individuals (I have counted as high as thirty-five) spring from a common root. At low elevations—that is, at the lower limits of the altitudinal range of the species—the phenomenon is extremely rare, but beyond a certain point in elevation the bulk of the species occurs in these close associations. My observations lead me to the conclusion that this method of growth is due primarily to some peculiarity in the dispersion of the seed of the species at high elevations which does not exist at lower levels. According to this theory each association represents the germinating seeds in one cone, torn off before seed dispersion had taken place and more or less deeply buried in the soil where it fell. The young seedlings, crowding each other closely, have become united through a process of natural graftage where the crowding and abra-

sion of the bark and cambium first began, namely, at the root crown or short distances above it.

On the Umpqua-Rogue River divide and on the slopes of the Cascades the noble fir does not often form groupings in which it occupies the dominant ratio, but on the crest and high southern slopes in the Siskiyou Mountains, from Siskiyou Peak as far west as my examination extended, the species covers large areas with stands in which its ratio runs from 90 to 95 per cent. In these mountains it is the dominant species in the alpine-hemlock type of forest.

White pine, alpine fir, and Engelmann spruce mostly occur as scattered individuals or small aggregations in mixed stands of alpine hemlock and noble fir. Occasionally, in the high country between Mount Pitt and Klamath Point, the spruce in some of the canyon bottoms is present in as high ratio as 75 per cent. An example of this kind exists in T. 34 S., R. 5 E., in the upper portions of the canyon of the South Fork of Rogue River. The forest is an old growth not visited by fire for perhaps three hundred years. The soil is exceptionally deep and is swampy or watersoaked. The composition of the stand is as follows:

Composition of forest in T. 34 S., R. 5 E., Oregon.

	Per cent.
Engelmann spruce.....	75
Lodgepole pine.....	20
Noble fir.....	4.5
White pine.....	.5

THE FOREST AS A COMMERCIAL FACTOR.

The forest in this region possesses a twofold value: First, as a commercial factor in its relation to the demand and supply of lumber products and fuel; second, in its more or less obvious effects upon streams. It will here be considered in its commercial aspect.

AMOUNT AND DISTRIBUTION OF COMMERCIALY VALUABLE TIMBER.

Commercially valuable timber is, strictly speaking, any kind of timber having sufficient dimensions to make it available for use either in the manufacture of the various lumber products entering into trade or in the coarser stuffs utilized as fuel. Obviously, therefore, if we desire to know the ultimate and actual timber resources of any particular area the standard employed in their estimation must be sufficiently broad to cover all classes and dimensions of the standing timber and the unit of volume must be the cubic foot.

In the forested regions of the West the cubic foot as a unit of volume is never employed in estimating timber on root. There are various reasons for this practice. First, timber is cruised and

estimated chiefly for sawmill purposes, where the unit of volume is the foot B. M., and, second, accurate estimates based on the cubic foot unit are extremely difficult in the Western forests with their tall growing trees and the ever varying ratios between the perimetrical and longitudinal dimensions of the tree cone, and would involve much time and outlay without any particular benefit to the lumberman. For these and other minor reasons our estimates of the timber capacities of the Western forests are based on the board-foot measure, a system which falls very far short of expressing the true value of the forest in these regions. The difference between estimates based on cubic measurements and on board-foot measurements in the timber volumes of the Western forests is largely a matter of speculation. All cubic estimates that have come to my notice are clearly mere guesswork. They all show the same defect, that of a gross underestimation. My observations in Idaho, Oregon, and Washington have conclusively established in my mind the fact that estimates based on the board-foot unit do not show the entire timber volume by ratios varying from 300 to 2,000 per cent. In other words, the ultimate volume of timber on any given area is from three to twenty times greater than that shown in board-measure estimates.

The standard of estimates in vogue among sawmill men and cruisers is subject to a great deal of variation depending on positions of the forested tracts with reference to transportation facilities, the local or export requirements, and the general scarcity or abundance of timber. The same holds good with reference to the species of trees which are considered fit for mill timber. Thus, where timber is abundant the lodgepole pine is regarded as unfit for lumber, while in localities where timber is scarce the species is found to serve very well. Such is also the case with the white fir and other less common species.

In the region where the following estimates were made there are many local standards or practices of estimate and cutting in vogue. It was found to be impossible to reconcile these widely differing practices, and a standard was adopted designed to show the amount of timber available under fair and judicious lumbering methods. The smallest admissible dimensions were fixed at 8 inches basal diameter at 18 inches from the ground, and 10 feet of clear trunk. But it was found that in most cases these two specifications did not exist in the same individual. For this reason most of the timber estimates in this report are based upon butt diameters of 11 inches.

The species of trees generally sawn in this region are limited to three, viz, yellow and sugar pine and red fir. In some localities the incense cedar is sawn into shingles, but its use for this purpose is not common. For fencing material yellow pine, sugar pine, red fir, and incense cedar are utilized on both sides of the Cascades, and, on the eastern side in addition to the species enumerated, lodgepole pine and western juniper. As fuel the following species are made use of:

Yellow pine, sugar pine, red fir, western juniper, oak, and madroña. West of the Cascades the various oaks and the madroña are preferred for fuel purposes. Little or none of the timber is cut for railroad cross-ties or for telegraph poles.

In the estimates are included the following species of coniferous trees: Yellow pine, sugar pine, white pine, red fir, white fir, noble fir, incense cedar, western hemlock, alpine hemlock, and Engelmann spruce. In the local cruising made in the region the above-enumerated species are usually taken into account, with the exception of white fir and alpine hemlock, which are excluded.

The total quantity of timber, with sufficient diametrical and longitudinal dimensions to make it available for sawmill purposes, growing in the region under examination was 19,981,209,200 feet B. M. in the year 1899, estimated on the basis indicated above. It was divided among the various species as follows:

Sawmill timber in Cascade Range Reserve and adjacent regions, Oregon.

Species.	East of the Cascades.	West of the Cascades.	Total.
	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine.....	6, 519, 896, 600	2, 957, 623, 800	9, 477, 520, 400
Sugar pine.....	78, 754, 800	735, 147, 300	813, 902, 100
White pine.....	16, 840, 000	113, 630, 500	130, 470, 500
Red fir.....	310, 476, 200	6, 327, 788, 600	6, 638, 264, 800
White fir.....	555, 092, 400	660, 433, 600	1, 215, 526, 000
Noble fir.....	116, 480, 000	769, 344, 400	885, 824, 400
Incense cedar.....	12, 670, 000	78, 723, 600	91, 393, 600
Alpine hemlock.....	72, 930, 000	536, 689, 800	609, 619, 800
Western hemlock.....	.....	46, 718, 200	46, 718, 200
Engelmann spruce.....	21, 620, 000	50, 349, 400	71, 969, 400
Total.....	7, 704, 760, 000	12, 276, 449, 200	19, 981, 209, 200

In the above table the summit of the Cascades is taken as a divisional line between the eastern and western sections of the region.

Taking into account the acreage of the two sections the average stand per acre is as follows:

Stand of timber east and west of the Cascades.

	East of the Cascades.	West of the Cascades.
Wooded and forested area.....acres..	1, 592, 700	1, 405, 740
Average stand of timber per acre..ft. B. M..	4, 837	8, 733

A comparison of this kind is valuable only in a general way. It does not convey a true idea of the actual density of the mill timber on small tracts on either side of the range. The reason for this lies in the greatly varying age and composition of the different forest types. For example, on the eastern side of the Cascades the yellow-pine forest is frequently cut up by extensive growths of lodgepole pine, in some places 30,000 to 40,000 acres in a body or scattered in smaller bodies through a number of townships but connected by narrow lines of the same kind of growth. These lodgepole-pine stands carry no mill timber, or small quantities only, but in a classification of the land into forested and nonforested areas they obviously belong in the forested class. The actual volume of timber per acre measured by the cubic-foot unit is often very much greater in these noncommercially valuable stands than in pure yellow-pine growths scaling 10,000 feet B. M. and upward. But whatever their volume may be their presence only serves to lower the average acreage stand of mill timber on the forested areas where they occur. Much of the region under examination is composed of high subalpine regions which naturally carry light stands of timber. Extensive fires have devastated them at various times. Reforestations of all ages and differing in composition cover them. These reforestations are forest to all intents and purposes. Their timber volumes are often considerable, but the dimensions are too low to come within mill-timber classifications. In other places fires have destroyed a certain percentage of the forest. The damage may vary from 10 to 60 per cent or higher. The destruction has not been all in one place or body. The fire has run through the forest for miles, burning a tree or a group of trees here and there. All these factors become apparent enough when any large tract of forest in this region is cruised, and they lower the average stand of mill timber, where a large area is in question, with surprising rapidity. It is only when tracts of comparatively limited size are examined that a correct idea of the actual and possible stand of mill timber in this region can be formed. The following examples of mill-timber stands in different townships will give a better view of the density of the forest in various portions of the regions than can be obtained from the figures based on a general average:

Stand of mill timber in T. 32 S., R. 1 E., Oregon.

Forested area.....	acres..	23, 040
Mill timber	feet B. M..	247, 240, 000
Average per acre.....	do...	10, 730

This township is situated on the southern slopes of the Umpqua-Rogue River divide, and carries a forest composed chiefly of red-fir type. Owing to the rocky and broken character of the region the stand is rather below the medium density for the red-fir type.

Stand of mill timber in T. 32 S., R. 3 E., Oregon.

Forested area.....	acres..	17,940
Mill timber	feet B. M..	452,240,000
Average per acre.....	do...	25,264

The township is situated in the Rogue River bottoms. Its forest is of the red-fir type and represents fairly the best class of this type of forest in Rogue River Valley.

Stand of mill timber in T. 36 S., R. 4 E., Oregon.

Forested area.....	acres..	16,040
Mill timber	feet B. M..	248,000,000
Average per acre.....	do...	15,461

This tract is situated in the region south of and surrounding Mount Pitt, and is typical of the red-fir type at medium density.

Stand of mill timber in T. 39 S., R. 5 E., Oregon.

Forested area.....	acres..	21,140
Mill timber	feet B. M..	328,000,000
Average per acre.....	do...	15,515

This township is situated in Klamath Gap, and is typical of the best and heaviest yellow-pine type of forest.

Stand of mill timber in T. 41 S., R. 3 E., Oregon.

Forested area.....	acres..	7,000
Mill timber	feet B. M..	10,000,000
Average per acre.....	do...	1,428

This township is situated on the southern slopes of the Siskiyou Mountains and is subject to the stress of semiarid conditions. It represents the average stands of the yellow-pine type at the lower limits of its growth in this region. Between the two examples given of the yellow-pine type there are all sorts of variations, the average acreage running 5,000, 7,000, and 9,000 feet B. M. for stands of medium density.

It is in the alpine-hemlock type of forest that the stands of timber become thin and light and make the factor which is responsible for the low general average of the forest stands west of the Cascades in this region. The following examples exhibit clearly this condition:

Stand of mill timber in T. 28 S., R. 5 E., Oregon.

Forested area.....	acres..	23,040
Mill timber	feet B. M..	40,000,000
Average per acre.....	do...	1,736

The tract occupies the summit and high slopes of the Cascades. Fires have run through 18,000 acres of the township, destroying 75 per cent of the timber.

Stand of mill timber in T. 31 S., R. 6 E., Oregon.

Forested area.....	acres..	21,440
Mill timber.....	feet B. M..	50,520,000
Average per acre.....	do....	2,315

This township also occupies summit and high slopes of the Cascades. It is a good example of the capacity in mill timber of the better class of the alpine-hemlock type of forest as it commonly occurs.

East of the Cascades the forest does not show as great variations in the density and amount of mill timber per acre as are met with west of the range. The following townships furnish typical examples of the different grades:

Stand of mill timber in T. 31 S., R. 10 E., Oregon.

Forested area.....	acres..	23,040
Mill timber.....	feet B. M..	220,800,000
Average per acre.....	do....	9,583

This township is covered with a forest of yellow pine running 95 per cent pure. It is typical of the heaviest forest growth in the Upper Klamath Basin so far as this examination extended.

Stand of mill timber in T. 34 S., R. 11 E., Oregon.

Forested area.....	acres..	15,040
Mill timber.....	feet B. M..	79,000,000
Average per acre.....	do....	5,252

The forest in this township is representative of a medium class of stands in the region. From this average of 5,252 feet B. M. it varies to amounts less than 1,000 feet per acre where the forest comes in contact with true semiarid conditions. The forest of alpine-hemlock type carrying timber suitable for mill purposes is, east of the Cascades, confined to the slopes of this range. It averages about 30 per cent lighter than the same type west of the range.

Excluding the areas denuded of forest through logging operations, or partly cleared for purposes of agriculture, it is patent to the most ordinary observer that the present stands of timber fit for mill use are vastly below what the region is capable of producing. There is not a single township of all those examined, either east or west of the Cascades, where this does not hold true. The greatest deficiency occurs in the red-fir type, the least in the yellow-pine type, while the alpine-hemlock type holds an intermediate position.

As illustrative of the vast difference existing in stands of mill timber on areas practically identical in soil, moisture, and topographical features, the following examples are adduced:

Difference in stands of mill timber in Cascade Range Reserve and adjoining regions under practically the same conditions.

IN THE RED-FIR TYPE.		Feet B. M.
T. 33 S., R. 3 E		806, 880, 000
T. 32 S., R. 3 E		452, 240, 000
Difference		354, 640, 000
IN THE ALPINE-HEMLOCK TYPE.		
T. 36 S., R. 5 E		139, 700, 000
T. 32 S., R. 5 E		68, 960, 000
Difference		70, 740, 000

These examples are of the better classes of stands on the western side of the Cascades. Among the townships carrying lesser amounts the relative differences are much larger. On the eastern side, with its large areas of exclusive yellow-pine type, the variations are smaller, but nevertheless great enough to become conspicuous.

The question arises, If all the forested areas carried mill timber to their ultimate capacity, what amount, as the gross total, would the region contain? To deduce a fair average for each of the three forest types it is necessary to consider the natural conditions under which the forest grows.

The region west of the Cascades in the Rogue River Basin is subject to semiarid pressure from three directions, viz, from the east through Klamath Gap, from the south over the Siskiyou Mountains, and from the west by extensions into higher elevations of the low-lying, almost wholly nonforested depression at the western base of the Cascades. In the Umpqua Basin the semiarid and subhumid conditions of stress prevalent throughout the Rogue River Basin are absent, at least so far as the region examined is in question. The yellow-pine type is the portion of the forest which comes in closest contact with these semiarid pressures. Along the lower and middle limits of the red-fir type are seen the effects of the semiarid and subhumid conditions advancing through the yellow-pine type in a diminished density of stands and smaller dimensions of the trees. There is in consequence a broad belt of red-fir type lying adjacent to the yellow pine which naturally could not produce a forest of any but a medium density. The heaviest growths of this type in our region are found in a north-south belt 6 to 12 miles wide lying just to the west of the last declivities of the upper or summit terrace of the Cascade Range.

The alpine-hemlock type of forest suffers but little as yet from the upward extensions of semiarid and subhumid conditions. Its growth along the upper limits of its altitudinal range is under more or less acute stress of low mean annual temperatures, depending on the varying slope of exposure.

On the eastern side of the Cascades in the Upper Klamath Basin most of the tracts are under semiarid pressure, advancing from the south and east, and everywhere the character of the growth of the forest shows unmistakable evidence of this fact.

Considering these factors and the extent of the areas upon which they are in operation, I would place the natural average ultimate capacity of the different forest types in mill timber at the following amounts:

Ultimate acre capacity of forest types in mill timber in Cascade Range Reserve and adjacent regions, Oregon.

Type.	East of the Cascades.	West of the Cascades.
	<i>Feet B. M. per acre.</i>	<i>Feet B. M. per acre.</i>
Yellow-pine type	18,000	30,000
Red-fir type.....	25,000	60,000
Alpine-hemlock type.....	12,000	25,000

Assuming that the average age of stands of first-class mill timber is 175 years (in reality, I think it may be somewhat higher) the above computations would mean that a forest in this region left to a natural course of growth for a period of 175 years would carry the amounts specified above.

It remains to compare the present quantity of mill timber with the possible quantity which the region could carry under ordinary natural conditions. For this purpose the area logged clean will have to be deducted from the total forested areas, as it does not enter into the estimates of the present available timber, and a suitable deduction made for the areas partly logged. Reducing this latter factor to a ratio which will express its areas in acres logged, the total acreage is as follows:

Area covered by different forest types in Cascade Range Reserve and adjacent regions, Oregon.

	West of the Cascades.	East of the Cascades.
	<i>Acres.</i>	<i>Acres.</i>
Yellow-pine type—Forest area examined	330,040	1,450,420
Logged	66,200	33,700
Net	263,840	1,416,720
Red-fir type—Forest area examined	817,840	58,580
Logged	28,300	0
Net	789,540	0
Alpine-hemlock type—Forest area examined	257,860	83,700
Logged	0	0

Applying the estimates of ultimate capacity to the nonlogged areas, the results are as follows:

Ultimate total capacity of forest types in Cascade Range Reserve and adjacent regions, Oregon.

WEST OF THE CASCADES.

	Feet B. M.
Yellow-pine type	263,840 by 30,000 = 7,915,200,000
Red-fir type	789,540 by 60,000 = 47,372,400,000
Alpine-hemlock type	257,860 by 25,000 = 6,446,500,000
Total	<u>61,734,100,000</u>

EAST OF THE CASCADES.

Yellow-pine type	1,416,720 by 18,000 = 25,500,960,000
Red-fir type	58,580 by 25,000 = 1,464,500,000
Alpine-hemlock type	83,700 by 12,000 = 1,004,400,000
Total	<u>27,969,860,000</u>
East and west section collectively	<u>89,703,960,000</u>

The estimates give 19,981,209,200 feet B. M. as the present available timber supply under fair logging practice. Subtracting this amount from the estimates of ultimate capacity there remains in favor of the latter the vast sum of 69,722,750,800 feet B. M., which represents the amount of mill timber the forest has fallen behind in producing capacity within the past 175 years. These estimates are conservative and do not take into account the great quantities of sapling growth which also would be present. Under practical, close, scientific management, I do not doubt the producing capacity of the forest in this region would greatly exceed the figures given above.

If we now divide the amount of mill timber representing the ultimate capacity over and beyond the present amount by the time required to produce it, viz, 175 years, the yearly increment is found to be nearly 400 million feet per year. At the lowest stumpage value this increase would mean a value at the present time of \$200,000 for each year of growth over the entire region. In point of fact it would mean at least 30 per cent more, for certain species and dimensions command a higher stumpage than 50 cents per thousand, and the sapling and young growth generally would be a factor of no little value. To accomplish this result would merely have required a complete suppression of forest fires, for to this cause, and to no other, is due the impoverishment of the present forest in this region.

AGE, DIMENSIONS, AND SOUNDNESS OF TREES.

The age of the timber utilized in sawmill consumption varies from 100 to 350 years. Most of the yellow pine falls below 175 years; the higher limit is reached chiefly in the sugar pine. Most of the sugar pine in the region is of great and mature age. Comparatively little red fir is sawn. It varies in age from 100 to 500 years, and some of the very large individuals seen were doubtless even older. The noble fir and white pine of mill-timber size varies in age from 100 to 350 years, most of it falling below 180 years. The alpine hemlock of mill size runs from 80 to 250 years, 120 to 140 years representing the age of the bulk of the standard growth. The white fir, with sufficient clear trunk development to come within the limit of these estimates, varies in age from 75 to 120 years.

The most common defects in the timber consist of fire scars in the yellow pine and sugar pine, usually occurring as spots in the lower third of the trunk denuded of bark and with the wood charred or burned more or less deeply. These defects are extremely common in the yellow pine east of the Cascades, where the wood of the species is more highly resiniferous than west of the range and where, in consequence, injuries of this nature are apt to extend over a larger proportion of the trunk. This defect often diminishes the lumber contents of the trunk in scaling by 10 to 20 per cent.

Most of the very aged sugar pine and red fir have rotten cores or gum cracks in their trunks. The incense cedar, on both sides of the Cascades, rarely has a sound center. It is seldom sawn except for shingles. The alpine hemlock is usually sound, even where the individuals have attained a great age, provided fire has not swept through the stands. Where such has been the case most of the trees will be found to have dead and decaying streaks through the trunk.

The dimensions of the various species run as follows:

Dimensions of species in Cascade Range Reserve and adjacent regions, Oregon.

Species.	Base diameter.	Clear trunk.
YELLOW PINE.	<i>Inches.</i>	<i>Feet.</i>
East of Cascades	14 to 48	10 to 35
West of Cascades.....	14 to 50	12 to 50
SUGAR PINE.		
East of Cascades	20 to 36	15 to 30
West of Cascades.....	25 to 96	25 to 70
WHITE PINE.		
West of Cascades.....	20 to 36	40 to 100
RED FIR.		
East of Cascades	14 to 28	10 to 25
West of Cascades.....	14 to 84	20 to 120
WHITE FIR.		
East of Cascades	18 to 36	None to 30
West of Cascades.....	18 to 36	None to 30
NOBLE FIR.		
West of Cascades.....	16 to 72	15 to 50
INCENSE CEDAR.		
East of Cascades	12 to 18	10 to 20
West of Cascades.....	16 to 45	20 to 65
WESTERN HEMLOCK.		
West of Cascades.....	10 to 14	10 to 20
ALPINE HEMLOCK.		
West of Cascades.....	10 to 32	12 to 50
East of Cascades	10 to 32	12 to 50
ENGELMANN SPRUCE.		
West of Cascades.....	10 to 30	None to 60

LOGGING OPERATIONS.

West of the Cascades 145,460 acres have been logged; east of the Cascades 57,000 acres. These operations involve the removal of all the way from 100 per cent to culling of the sugar pine alone. The most extensive operations have been in proximity to the Rogue River Valley settlements and the placer diggings southwest of the valley in the spurs of the Siskiyou Mountains. Sawmills have been erected at many places. They were small plants, sawing a while in the adjacent forest, then pulled down and moved elsewhere. The most extensive logging operations are now carried on in T. 40 S., Rs. 4 and 5 E.

Large amounts of the logged areas have been culled over by shake makers and much of the sugar pine has been cut for such purpose, involving the waste of a vast amount of valuable timber. As a rule but 10 or 12 feet or even less of the large growth sugar pine splits straight and easy enough to furnish shake material; the balance is rejected. It is not always possible to tell by a superficial examination whether the grain of a standing tree is straight or more or less twisted. The forests in the sugar-pine areas of Ts. 34, 35, 36, and 37 S., R. 3 and a part of R. 2 E., are littered with many millions of feet of rotting sugar pine rejected by the shake maker on account of slight imperfections of grain.

Consumption of timber for fencing material is not large. On the western side of the range firewood is mostly cut from the oak copses which grow at lower and more accessible elevations than most of the coniferous species.

Owing to the intermittent character of the smaller logging operations, it is impossible to state with any degree of certainty the yearly consumption of mill timber. The probability is that it amounts to something in the neighborhood of 100 million feet B. M. per year, including the areas east and west of the Cascades and taking into account the quantities used by shake and shingle makers. The logging operations have been confined to areas of yellow-pine and red-fir forest types. No logging or lumbering has been done in stands of the alpine-hemlock type, owing in part to the high elevations at which the type grows, which renders access to its stands difficult and expensive, and in part to the circumstance that, with the exception of the white-pine and portions of the noble-fir growth, the species which compose it are generally considered undesirable and unsaleable.

FOREST FIRES.

EXTENT OF FIRES.

Fires have widely ravaged the region examined. There is not a single forested township either on the west side or on the east side of the range in which the timber is not more or less fire marked. Without



A



B

BURNT ALPINE HEMLOCK, NOBLE FIR, AND LODGEPOLE PINE, NEAR HEAD OF NORTH FORK OF ROGUE RIVER.

much doubt the present agricultural areas, once grass covered and carrying scattered stands of oak, were burned over quite as extensively as the timbered tracts; at least there are few oaks that do not show fire marks. The only tracts that have escaped are the swampy sedge- and tule-covered areas bordering the Klamath lakes and marsh, and such spots at the higher elevations where bare lava or pumice fields made the spread of fires impossible.

Of the forested area examined, comprising in round numbers 3,000,000 acres, a total of 2,975,000 acres, or 99.992 per cent, are fire marked. The remaining 25,000 acres which have escaped are divided mostly in small tracts between the swampy bottoms of the Upper Rogue River forks and isolated tracts along the higher summits of the Cascades main range (Pls. LXXVII, *B*, and LXXIX).

TIME OF FIRES.

The aspect of the forest, its composition, the absence of any large tracts of solid old growth of the species less capable of resisting fire, and the occurrence of veteran trees of red fir, noble fir, white pine, alpine hemlock, etc., singly or in small groups scattered through stands of very different species, indicate without any doubt the prevalence of widespread fires throughout this region long before the coming of the white man. But, on the other hand, the great diversity in the age of such stands as show clearly their origin as reforestation after fires, proves that the fires during the Indian occupancy were not of such frequent occurrence nor of such magnitude as they have been since the advent of the white man.

The fires were more numerous and devastated much larger areas in the early days of the settlements than they have done in later years. Much the larger percentage of what may be classed as modern burns date back twenty-five to forty years. As time has passed, the frequency of forest fires in the region has much diminished. This is owing to a variety of causes, chief of which are the numerous fire breaks caused by the earlier burns; the gradual extinction of the game and consequent diminished number of hunting parties and lessened risk from unextinguished camp fires; the acquisition of valuable timber claims by private parties throughout the heavily forested sections and the measure of protection, prompted by self-interest, bestowed on their property and incidentally on adjoining areas, and, lastly, the destruction of the humus layer, the chief factor in the spread of forest fires in this region, by the earlier conflagrations and the insufficient accumulations of this material since then to support hot, large, and destructive fires.

While, as already remarked, the number of fires has much diminished in recent years, they have not by any means entirely ceased. Every year certain areas are burned over. None of the regional

divisions are exempt. The eastern slope of the Cascades, the summit and middle elevations of the range, the western slope, the slopes and summits of the Siskiyou with the country intervening between this range and the Cascades, all suffer more or less from this needless infliction. And there is little prospect that it will be otherwise for many years to come.

The age of the burns chargeable to the era of Indian occupancy can not in most cases be traced back more than one hundred and fifty years. Between that time and the time of the white man's ascendancy, or, between the years 1750 and 1855, small and circumscribed fires evidently were of frequent occurrence. There were some large ones. Thus, in T. 37 S., R. 5 E., occurs a growth of white fir nearly 75 per cent pure covering between 4,000 and 5,000 acres. It is an even-aged stand 100 years old and is clearly a reforestation after a fire which destroyed an old growth of red fir one hundred and five or one hundred and ten years ago. A similar tract occurs in T. 36 S., R. 5 E., only that here the reforestation is white pine instead of white fir.

The largest burns directly chargeable to the Indian occupancy are in Ts. 30 and 31 S., Rs. 8 and 9 E. In addition to being the largest, they are likewise the most ancient. The burns cover upward of 60,000 acres, all but 1,000 or 1,100 acres being in a solid block. This tract appears to have been systematically burned by the Indians during the past three centuries. Remains of three forests are distinctly traceable in the charred fragments of timber which here and there litter the ground. Two of these were composed of lodgepole pine. The most ancient one appears to have consisted of yellow pine, which would be the ultimate forest growth on this area following a long period of freedom from fire.

Along the summits of the Cascades from Crater Lake to Mount Pitt are very many even-aged stands of alpine hemlock 200 to 300 years old. These even-aged stands may represent reforestations after ancient fires dating back two hundred and fifty to four hundred years, but there is no certainty on this point.

ORIGIN OF FIRES.

It is not possible to state with any degree of certainty the Indian's reasons for firing the forest. Their object in burning the forest at high elevations on the Cascades may have been to provide a growth of grass near their favorite camping places, or to promote the growth of huckleberry brush and blackberry brambles, which often, after fires, cover the ground with a luxuriant and, to the Indian, very valuable and desirable growth. The chief purpose of the fires at middle elevations and on the plains or levels probably was to keep down the underbrush in the forest and facilitate hunting.

The white man's reasons for firing the forest in this region are much

clearer. The earliest settlers found that burned-over tracts in the timber attracted game; hence the forest was fired. Many of the conflagrations spread from camp fires, which the settlers rarely took the trouble to extinguish when breaking camp. They also set many fires for the purpose of destroying the underbrush to facilitate traveling through the forest. Where roads or trails were constructed fires were set to help clear the way. The builders of a road up the North Fork of the Rogue River and across the Cascades to the Deschutes River, known as the John Day road, are responsible for large tracts burned on either side of the road.

With the advent of the stockman came the burning of the forest for the purpose of promoting grass growth. This practice still survives, and outside the patrolled areas of the Cascade Range Forest Reserve tracts of forested lands are burned every year with this object in view.

As a rule grass growths after forest fires come only along the highest slopes and plateaus of the Cascades. Fires in the middle and lower elevations usually stimulate brush growths. Some of these brush growths, consisting of hazel, mountain mahogany, scrub oak, june or service berry, and various species of ceanothi are relished by cattle, and for the purpose of providing the stock with this sort of browse the timber is frequently burned. In certain of the forested districts a new industry is springing up, that of raising Angora goats. These animals are essentially browsers and eat almost any sort of brush. A number of places were noticed along the Rogue River where the timber had been burned apparently with the sole object of providing goat browse.

Fires are often set to attract game. The larger varieties of game are now becoming scarce in the region south of the Umpqua watershed. During the fall and late summer fires are started to attract game to the smoke and save the trouble of hunting it very far from home. Deer, for example, are readily attracted to the proximity of fire and smoke. They stand in the smoke to escape the attack of flies and gnats, which are very troublesome at certain seasons of the year. Several fires started for the purpose of luring deer were observed during the summer. One in T. 33 S., R. 3 E., burned for a month in a very heavy stand of mixed red fir and sugar pine, destroying 15 or 20 million feet B. M. of merchantable mill timber before the fall rains put it out. It is not probable that more than a half dozen deer were obtained in return for this waste of timber. For similar reasons—to drive away flies and gnats—fires are often started where the forest is used for purposes of cattle and horse range. These fires are rarely tended, and they frequently spread over considerable tracts. Cases of this sort were observed in Ts. 36 and 37 S., Rs. 6 and 7 E. In the former township, at one place near Pelican Bay, a half dozen huge fires had been built in a row in the midst of a pile of inflammable forest litter. At the

tune of passing it had spread into the adjoining forest and had burned over between 300 and 400 acres. The fire in township 37 had started from a similar origin. When observed there was a solid line of fire for a distance of 2 miles into the adjacent forest.

Fires are not infrequently set to burn away windfalls across a traveled road. This is done to avoid the severe labor of fifteen minutes' work with the ax. By this method it often costs the public \$10,000 or \$15,000 to remove a rotten old log which could easily be thrown out of the road by bestowing the work of a quarter of an hour on it. A case of this kind came under my observation in T. 40 S., R. 4 E. In an attempt to remove a windfall from across a little-used road the fire in the log had spread into the adjoining forest, and at the time when I saw it had burned over about 3,000 acres.

AFTER-EFFECTS OF FIRES.

The after-effects of forest fires in this region are of two general classes. First, there are those which are due to a freer action of various atmospheric agencies on the denuded forest floor. These may be exhibited either in the form of a very decided desiccation of previously humid or subhumid areas, as regards the quantity of moisture retained in the upper layers of the soil throughout the growing season, or they may take the form of a rapid transfer of soil and rock débris from higher to lower levels. In the latter of these cases an accelerated and unimpeded drainage is the chief factor.

The second class of the general after-effects of fires consists in changes in the forest growth. These changes are of all degrees and are often exceedingly complicated. They depend upon the more or less complete destruction of the previously existing forest and very largely upon changes in the average annual soil humidity of the forest floor. The average annual soil humidity is, along isothermal and isohyetal lines, the most important factor in determining the composition of the forest in any particular district. It is subject to almost infinite variations, which as often depend on the chemical and mechanical composition of the soil as on the annual precipitation. Any interference with the annual ratio of soil humidity beyond certain points gives rise to variations in the composition of the forest on tracts where the interference has taken place. It is precisely what happens in the ditching and draining of a piece of low ground, for example, where, as the desiccation progresses, new plants tolerant of drier soil conditions come in and supplant the lowland or marsh forms of vegetation which formerly flourished there.

Widespread and intense forest fires powerfully affect the annual ratio of soil humidity on the areas burned over. To this fact is due the often strange and otherwise inexplicable changes in vegetation which occur on such tracts. The supplanting of humid forest types

with subhumid ones or the change of forest to brush growth is therefore not always to be sought in climatic changes, but is often due to local disturbances in the soil moisture ratio. Such changes may be either evanescent or permanent. When permanent they are probably due to climatic changes involving arid tendencies. We may in such cases suppose that the balance between forest and brush or between brush and herbaceous vegetation had reached an equilibrium where the slightest push toward arid or semiarid or subhumid types of growth was sufficient to tilt the balance beyond recovery to those conditions. In the region under consideration, as well as in many other places on the Pacific slope, it is evident that forest fires have supplied the requisite push.

On certain of the areas discussed in this report a special effect of forest fires is noticeable. It consists in the total destruction of every particle of soil composing the forest floor down to the hard, undecomposed lava rock. Examples of this occur in the region just south of Mount Pitt, where much of the bed rock consists of lava flows of no great age. The soil which covers these recent lava streams often is wholly composed of decayed vegetable débris with no admixture of decomposed or comminuted rock. When fire sweeps over a tract of this kind there is nothing left behind but the bare lava rock; the soil, which has required centuries for its formation and accumulation, is burned away completely. Cases of this kind are found in many places along the summit of the main range of the Cascades. They are especially numerous and conspicuous in the region between Mount Pitt and Mount Brown, the latter an extinct volcanic cone a few miles south of Pitt; on the southern slopes of Union Peak; on the lava ridges at the head of Cherry Creek in T. 34 S., R. 5 E.; and on the lava plateau to the west of Lost Peak in T. 35 S., R. 5 E. Many of the lava flows on these areas have always been bare and devoid of vegetation since they were ejected from the now extinct craters which dot the region, but by far the greater number were covered with a layer of humus soil when the white man came into the country. Stripped of soil, brush, and forest cover they present an extremely rough and desolate aspect, and many centuries must necessarily pass before sufficient soil can accumulate again to support a brush or tree growth.

The effects of forest fires in their relation to the accelerated transfer of soil and rock débris from higher to lower levels are noticeable everywhere throughout the region, but are not very conspicuous outside the pumice-covered areas. Owing to the extremely light, loose, and porous nature of this material, but little force is required to move great quantities long distances in a brief period of time. At the sources of the North Fork of Rogue River, in the main range of the Cascades, where the pumice débris is many hundreds of feet in thickness and where the forest has been burned away to the extent of 60 to

70 per cent, the increase in the ratio of surface degradation due to forest fires is conspicuous enough to arrest the attention of any observer. The numerous small affluents which form the main fork of the river lie here, for portions of their length, in deep canyons wholly excavated in the loose, fine pumice. The timber and brush which formerly grew on the canyon slopes and protected them against too rapid wastage are burned away. As a consequence, great masses of pumice are constantly sliding into the streams, the current in the river is at all times, except in winter, loaded with vast quantities of pumice, and the terminations of the canyons are rapidly extending eastward into the broad pumice plateau which forms the crest of the main range of the Cascades between Union Peak and Diamond Lake. The transportation to the lowlands and the deposition there of the fine pumice is not especially detrimental to any interest, but the destruction and removal from the upper slopes of the Cascades of the enormous water sponge of absorbent pumice sand, hundreds of feet in thickness, and the exposure of the underlying hard and often impervious lava can not fail to exert a deleterious influence upon the regimen of the streams heading in the region.

A remarkable and striking example of surface denudation in a level region, due to the destruction of the protective covering of brush and timber, and extending over a long period of time, occurs in T. 33 S., R. 13 E. The country here is a level or gently rolling region bordering Syean River, and originally was evidently covered with a deep, uniform deposit of fine pumice, resting on rough, hard, impervious lava. The aspect of the region at the present time is that of narrow belts of timber stretching across areas of rough, barren, or thinly grassed lava fields. The belts of forest represent tracts that have escaped destruction by fire, and where, in consequence, the pumice, which is the chief soil component of the region, still remains. The rocky and barren areas are due to the burning of the forest and the subsequent exposure to unimpeded action of the various natural denuding agencies. At the present time fires occasionally run and destroy sections of the timber belts in this locality. Where such destruction takes place, there is a comparatively rapid wastage of the pumice, with the unavoidable change to a hard, sterile surface of rough lava. The rock which here underlies the pumice is a poor retainer or absorber of water. The water from the melting snow in spring and what falls as rain at other times throughout the year runs off with extreme rapidity, and but for the surrounding mountains the region would be a desert during a larger portion of the year, so far as regards the water supply.

There is little doubt that a very large proportion of the many rocky, level tracts which occur east of the Cascades in the region under consideration are wholly due, as to the character of their present surface,

to frequently repeated fires. The pumice originally laid down at the bottoms of shallow lakes would be evenly spread out. As the lakes were being gradually drained thick masses of marsh vegetation would preserve the pumice surface from wastage. The marsh vegetation was finally supplanted by forest; then man came on the scene and with fire as an ally made some profound changes. The entire series of phenomena here detailed, not omitting the part played by fire, are in full operation at the present time in the region bordering Klamath Marsh, and in various other localities, such as Sycan Marsh and tracts bordering the Klamath lakes.

The pumice-covered region which is situated on the summits, slopes, and in the canyons of the Cascades, together with the level tracts east of the range, which likewise bear a surface deposit of the same material, comprise in the aggregate a very large area. Here the pumice not alone fulfills the office of soil; it is, besides, a huge water sponge, possessing enormous absorptive powers. Much of it exists in a finely comminuted state, and unless held in place by spreading roots of strong growing vegetation, or protected by a dense, tough turf, its denudation down to the underlying bed rock by rains and the water from melting snows is certain. On steep slopes the action is rapid; on level plains it is slow, but no less sure. Its action as an absorbent and retainer of precipitation is, perhaps, of little importance in the plains region east of the Cascades, so far as it relates to the regimen of the few streams that head in those tracts, but it is of great importance to the flow of the streams which head on the slopes and on the summit of the Cascades, in the region where this deposit attains its greatest thickness. Any agency, such as forest fires, much grazing, or trampling of stock, that destroys the stability of the pumice slope or level, accelerates in a high degree the ratio of pumice denudation. Evidence proving this to be true exists everywhere at the head of the streams in the pumice belt along the tracks of the great fires, and throughout the more extensively pastured sheep ranges and runs. The remedy must be sought in protecting the forest cover from fire and in regulations to restrict the unlimited pasturing of stock on the pumice-covered areas.

The second class of the general after-effects which follow forest fires consist in the more or less complete permanent or temporary changes which take place in the composition of the forest. There are a number of conditions created by the fires which combine to cause such changes, but my observations confirm my belief that to changes in the ratio of soil humidity must be ascribed most of the variations observed in reforestations after fires. As a rule, destruction of the forest upon any area by fire, no matter what the direction of exposure may be, tends to the production of drier soil conditions (1) by inducing increased evaporation and (2) by accelerating the surface drainage.

The result is that species of trees, or in fact any kind of vegetation which can exist on the diminished ratio of soil humidity, will, on such tracts, prevail in numbers and volume over forms of vegetation requiring more soil moisture for their growth.

In the region under consideration the proposition outlined above holds good in every case where any considerable area has been completely or nearly denuded by fire. Thus, on the summit and on the higher slopes of the Cascades from Diamond Lake southward to the north end of Lake of the Woods are very large reforestations of lodgepole pine, 80 to 95 per cent pure. The lodgepole pine has replaced a former forest of alpine hemlock and noble fir destroyed by fire. But although a great many seed trees of these species escaped destruction they have failed to reproduce themselves on the burned-over areas for no other reason than failure of their seeds to germinate on the dried-out forest floor. On adjacent areas in these same districts, where the natural seepage or soil moisture was not seriously interfered with, there are abundant reforestations of alpine hemlock and noble fir. Reforestations of lodgepole pine are of a transient character at high elevations in the southern Cascades. After a longer or shorter period of time the soil in stands of lodgepole pine regains its former ratio of moisture. This is proved by the occurrence of reforestations of lodgepole pine, which are giving way to species requiring a higher ratio of soil humidity. The more common species which replace lodgepole pine stands at the higher elevations are alpine hemlock and noble fir; at lower levels white and red fir, while in the upper canyons of the South Fork of Rogue River, Engelmann spruce is sometimes found replacing old, mature, and decaying growths. On the levels as well as on the mountain areas east of the Cascades, where the normal forest growth is chiefly yellow pine with small admixtures of sugar pine and white fir, reforestations after fires are nearly always pure growths of lodgepole pine. But in the yellow-pine areas of Ts. 41, 40, and 39 S., Rs. 4 to 6 E., inclusive, reforestations after fires are not composed of lodgepole pine. Reforestations here are yellow pine, red and white fir, sugar pine, and incense cedar; in short, the same species again come in which flourished before the fire. The reason for the difference between the two localities lies chiefly in the fact that east of the Cascades the soil is largely pumice or has considerable pumice in its composition, a soil which, when freely exposed to the direct rays of the sun, rapidly parts with its moisture to a depth of 2 or 3 feet, while the soil in the townships enumerated is of a different quality and is tenaciously retentive of moisture.

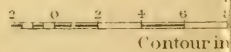
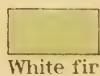
Reforestations after fires at middle elevations on the western slopes of the Cascades and in the more humid sections on the eastern slope, between 5,000 and 6,000 feet, are extremely varied and complex. But, although we can not express the determining factor of these



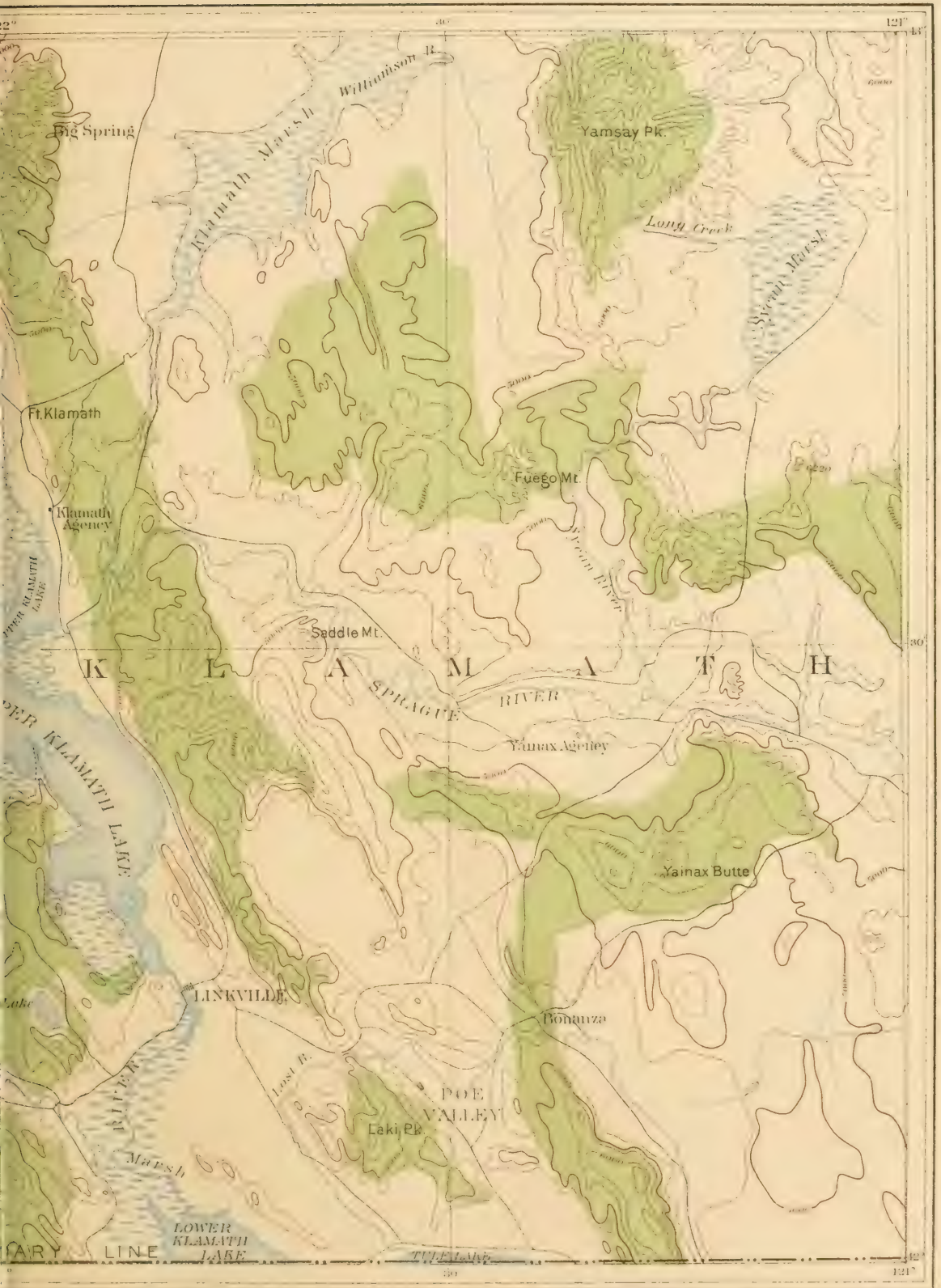
PART OF SOUTHERN OREGON SHOWING

Prepared under the direction of H. H. Henshaw

BY JOHN W. GARDNER



Contour interval 100 feet



THE DISTRIBUTION OF WHITE FIR

by G. G. Gannett, Geographer in charge

W. H. LEIBERG

Scale 1:50,000
0 10 12 14 16 18 20 MILES

Vertical scale 500 feet

changes in definite figures and terms, for want of sufficient observations, there can be little doubt that all the modifications and variations in the forest composition after fires are due here as elsewhere to changes in the annual ratio of soil humidity. At least this explanation will suffice to account for much the larger proportion of the phenomena involved in reforestations in this region.

Fires in the mixed growth or in timber stands where the red fir predominates are frequently followed by great masses of white-fir seedlings, which develop into heavy and dense forest stands, and occupy the ground for a century or more. An example of this kind occurs in T. 37 S., R. 5 E. We here have a forest composed almost wholly of white fir, in the midst of which rise here and there huge veterans of red fir 400 to 500 years old. The white fir is a reforestation, a hundred years old, following a burn which destroyed a mixed growth in which red fir largely predominated. Notwithstanding the fact that large numbers of seed trees of red fir escaped destruction, this species was quite unable again to occupy the ground as the first forest growth after the fire.

In the region around the eastern base of Mount Pitt, along the upper limit of the growth of the red fir, reforestations sometimes come in which are almost wholly composed of white pine. This species, while a normal component of the mixed growth in the upper subhumid and the lower humid areas of this region, occurs only as scattered trees barely holding their own among the surrounding masses of red, noble, and white firs. Its sudden ascendancy on certain burned-over tracts is wholly inexplicable. It is not owing to a preponderance of seed trees, for seed trees of the various firs are always much more numerous. Nor is it owing to tolerance, for there are many other burned-over places just as open and free from shade, where adjacent seed trees of the white pine are quite as plentiful. In the south-central areas of T. 33 S., R. 3 E., occur similar reforestations of white pine following burned stands of red and white firs. Here as elsewhere the white-pine seed trees were in the minority, white and red firs predominating.

The central areas of Ts. 31 and 32 S., R. 3 E., carry dense stands of old-growth forest, normally composed of a preponderance of red fir with varying percentages of white fir, western hemlock, white pine, sugar pine, and yellow pine forming the remainder. The soil is a punice detritus resting on vesicular, much fissured lava; hence in a condition to part with its moisture readily and quickly. The solidity of this old growth is broken in many places by old burns more or less completely reforested. The reforestations are mostly, and sometimes wholly, composed of yellow pine, although this species forms under normal conditions the smallest percentage of any of the trees in the surrounding old-growth forest. Where the yellow-pine reforestations have reached an age of 200 years and upward, the yellow pine is

giving way to the encroaching red-fir growth. Where fires of modern date have burned away the yellow-pine reforestations in these places, lodgepole pine or brush growths have taken possession.

While no absolute rule can be formulated to cover all the various phenomena in reforestations after fires, it can nevertheless be said that as a general and broad rule the following is applicable to the forest conditions in this region outside the pure yellow-pine growths on the eastern side of the Cascades: The tendency of all reforestations after fires in the humid and subhumid forest types is to form *pure-growth* stands of the species naturally occurring in the region, the condition or ratio of soil humidity, an ever-varying factor, determining the particular species. The abundance or scarcity of seed trees and the degree of tolerance possessed by the various species are factors of trifling importance.

Growths after fires on the eastern side of the Cascades in pure yellow-pine forest may either be brush or timber. When timber, the reforestations are usually lodgepole pine. Sometimes the growth is a nearly pure stand of white fir. This happens on slopes and flats so situated that they become the recipients of an extra amount of seepage due to accelerated drainage from burned-over tracts at higher levels. Brush growths after fires are due to induced semiarid conditions. Many of the yellow-pine stands east of the Cascades abut upon areas where semiarid or almost true arid conditions obtain. The balance between subhumid and semiarid states often is so nicely adjusted that but a slight change of equilibrium is necessary to effect a permanent change. Where, in such places, fire has lessened the ratio of soil humidity, permanent brush growths usually take the place of the forest. In the big lodgepole-pine reforestations bordering Sycan and Klamath marshes, fires usually leave permanent open areas on which a scant grass growth or scattered brush of semiarid types of vegetation maintains a precarious existence.

On the western side of the Cascades there are comparatively few areas carrying pure stands of yellow pine. Most of the yellow-pine growth is more or less mixed with varying proportions of red fir. Fires in the lower and drier areas of this type of forest are commonly followed by increased growth of various kinds of ceanothus, manzanita, and brush-like or truly arborescent forms of madroña (*Arbutus menziesii*). Sometimes in the upper areas of the subhumid and in the lower portions of the humid tracts fires, instead of being followed by reforestations, give rise to enormously dense brush growths. Tracts of this sort are found in scattered patches everywhere along the middle elevations on the western side of the Cascades, and throughout the Siskiyou Range in the region examined. The most conspicuous examples occur from Mount Pitt northward, in Ts. 36, 35, 34, 33, 32, 31, and 30 S., R. 4 E. The forest, previous to the burns, which are of recent origin, consisted

chiefly of red, white, and noble firs. On a nearly continuous area comprising 58,600 acres the forest has been burned to the extent of 98 per cent, and has been supplanted by brush growths which have every appearance of permanency on the larger proportion of the area. The southern half of the burned district carries the densest stands of brush: in the northern the growths are more scattered. In the former the brush is composed of shrubby chinquapin, service berry, manzanita, scrub oaks, vellum-leaved ceanothus, *Garrya*, and willow. In the latter of huckleberry, blackberry, and various species of ceanothus. The northern areas contain a patch here and there which shows feeble signs of reforestation. The southern tracts present solid masses of brush, comparable to the chaparral slopes in southern California, but even more impassable than they. The brush growths are mostly on slopes facing the west or the south; exactly the situations in which the lowering of soil humidity would be most severely felt.

In T. 40 S., R. 3 E., are large brush-covered tracts following the destruction of a nearly pure growth of red fir. The brush is largely composed of *Ceanothus sanguineus*.

It is, of course, impossible to say with absolute certainty that forest will never again replace such brush growths. Situated as they are, within zones of medium precipitation, the chances are naturally favorable for a return of the forest. But these brush growths are at least 30 years old, and as yet exhibit no evidence of change. We may therefore conclude with a great deal of certainty, that although a return to forest may be the ultimate destiny of these firmly established brush growths the event will be very long delayed. In T. 33 S., R. 3 E., occurs a number of stands of very old madroña scattered among a massive old-growth forest chiefly composed of red fir, with smaller proportions of white pine, sugar pine, western hemlock, and Pacific yew. The madroña is not a tolerant tree. Its chief place is among open yellow-pine and red-fir stands, or alone in thickets of manzanita or mixed with oak copses. Yet in this locality we find it growing in company with such trees as the Pacific yew, the most tolerant tree in the arboreal flora of the north Pacific slope. The only explanation which suggests itself is this: That ages ago the present growth of red fir was preceded by brush growths or scattered stands of yellow pine, supposedly due to fires changing the soil humidity. During this period of subhumidity or semiaridity the madroña may have come into the flora in this locality, persisting throughout the changes involving a return to greater ratios of soil humidity. The madroña in this locality is composed of old trees. Several were observed 75 feet in height and 2 feet in diameter. The reproduction of it here has practically ceased. If the supposition now advanced to account for the presence of the madroña in such an incongruous place of growth be the true one, there is at least a basis for the further supposition that the vast and densely brush-covered tracts

stretching northward from Mount Pitt along the higher flanks of the Cascades may likewise again recover their former forested condition.

Another after-effect of fires consists in the substitution of grass-covered tracts for the former forest cover. This feature may be observed everywhere along the upper slopes and summits of the Cascades and the Siskiyou in this region. The growth is often grass, but much more commonly it is low-growing mountain sedges or a mixture of both. Where soil humidity permits, the growth becomes matted and forms a more or less continuous turf. More often it is scattered either in circumscribed patches or in isolated tufts. The sedges usually form the turfy places while the grasses occur in isolated bunches, or both sedges and grasses grow in tufts, depending on what species make up the growth. These grassed-over places are, and have been, of commercial importance since the upper plateaus and summits of the Cascades began to be utilized for sheep pastures. All of these pastures and meadows which owe their origin to fires are merely temporary affairs. If suffered to remain undisturbed by further fires they will return to forest cover. Around Diamond and Crater lakes the grassy places are slowly giving way to stands of lodgepole pine as the primary reforestation. On the lava plateaus flanking the crest of the range in Ts. 34 and 35 S., R. 5 E., grassy places created by fires before the advent of the white man have, in course of time, become covered with thick stands of lodgepole pine, now mature and giving way to stands of noble fir and alpine hemlock. During the first reforestation of lodgepole pine the grass and sedge may persist until the crop of this species matures and gives way to other kinds of trees, but with the advent of the noble fir and the alpine hemlock the grass and sedge growth commonly disappears.

A noticeable feature in connection with the after-effects of forest fires in the yellow-pine type of forest is the suppression of undergrowth and of seedling trees. The yellow pine is by all odds the best fire-resisting tree in the sylvæ of the North Pacific slope. Repeated conflagrations may run through stands of the yellow-pine type without serious damage to the older trees of this species, provided the litter and humus be not too great. But the fires, even should they be of no great force or intensity, work irreparable injury to the seedling trees. On the eastern side of the Cascades, especially, fires have run through the yellow-pine timber many times. The absence or relative scarcity of young growth and underbrush is here very noticeable and striking. Much of the region examined east of the Cascades is included within the boundaries of the Klamath Indian Reservation, and the red man has therefore been under no particular restraint in the matter of burning his timber. In late years it seems to have dawned on his intelligence that good yellow pine may have some value after all, and in consequence fires are set much less

frequently than formerly, with the result that where the forest has enjoyed freedom from fire for a number of years seedling and sapling trees of the yellow pine are springing up in the greatest abundance.

Having traced the more salient effects of fires, so far as they are connected with the reproduction and composition of the forest, there remains to be noticed the results of fires as affecting the value of the timber for commercial purposes on tracts which have been subjected to a more or less intense and destructive conflagration.

The amount of damage to the mill timber in a forest stand in this region which may be wrought by a fire varies considerably. It may run as low as 1 per cent in stands of yellow pine, or it may rise so high in stands of mixed growth that it practically amounts to total destruction. In this report a certain area has been segregated under the term "badly" burned. It comprises the tracts upon which the mill timber has been burned away entirely or to the extent of 75 per cent. Out of a total of 2,975,000 acres fire marked in this region 19.5 per cent, or 587,000 acres, are badly burned.

It is, of course, impossible to say with absolute certainty that so and so many million feet were destroyed in these fires, because we can not now ascertain the original density of the forest on the burned-over areas. Especially is this the case on the tracts termed badly burned. But assuming that the fire-swept areas were timbered as heavy proportionately as those that remain, it is safe to reckon the destruction as equal to 35 per cent of the standing timber, as estimated by the standard of "Michigan practice." Expressed in feet B. M. it amounts to 7,000 million in round numbers. This estimate is conservative, and errs, if at all, in placing it too low. As a rule, the areas upon which the destruction has been total, or approximately so, are situated in the heaviest timber, or are in localities where the heaviest timber would be expected to occur. Thus along the upper and middle slopes of the Umpqua ridges are many tracts which, before the fires, carried 60,000 to 70,000 feet of mill timber per acre. On some the timber is all dead, or practically so; on others there are 10,000 to 15,000 feet remaining. The dead timber still stands and can readily be estimated. On the other hand, in the yellow-pine stands the damage has not been so great. In this type of forest much red fir has undoubtedly been destroyed on the western side of the Cascades and much white fir on the eastern side of the range, if we may judge by the nonforested brush-covered spots so common throughout the yellow-pine stands in many localities, but the chief damage consists in the extensive searing and scarring of the yellow pine in the lower half of the trunk, the most valuable portion of the tree.

Of the 7,000 million feet of mill timber destroyed, 5 per cent, or 350 million feet, can clearly be traced as the work of Indians—at least most of it has been burned on the areas embraced within the boundaries of

the Klamath Reservation, and the inference that fires in this region were set by the Indians is fully warranted. The balance, or 6,500 million feet, can safely be charged against the white man.

To summarize the fire destruction in the region under consideration, it may be said that, not including clearings for purposes of settlements, the timber on 3 million acres, a total of 7,000 million feet of merchantable mill timber, has been destroyed within the past thirty-five or forty years.

The amount of damage inflicted on growing timber by a fire depends chiefly on the three following factors: (1) The time of the year in which the fire burns; (2) the quantity of litter or humus on the forest floor; (3) the fire-resisting capacity of the different species of trees. In the region under consideration the comparative lack of the second of these factors plays the chief rôle. Humus, as applied to a layer of decaying vegetable débris on the forest floor, is not, as a rule, of any great depth in the forests of these regions. In stands of the yellow-pine type it is a mere thin sprinkling of pine needles. In stands of red fir or mixed growth it is from 2 inches to 3, or, rarely, 4 inches in depth, but is reinforced by a more or less abundant litter of broken trees and branches, naturally shed or torn off by snow or wind. To the light humus layer and the small quantity of litter, more than to any other cause, is due the preservation of the forest from total destruction on these areas. Had there been, for example, the same depth of humus and an equal quantity of litter as in the timbered areas of northern Idaho the region would have been practically deforested by this time. It is not due to lack of fires that any timber remains.

The manner in which fire affects the individual tree varies with the fire-resisting capacity of the species. Here, as elsewhere, the yellow pine both as an individual and as a species stands at the head of the list. A fire in stands of this species runs rapidly, burns low, and with no great intensity owing to the extremely light humus cover. So long as the thick bark, which is a characteristic feature of the species, remains intact, the tree is tolerably safe, but sooner or later, either through the effects of repeated fires or through some accidental injury opening the bark and causing an exudation of resin, fire finds its way into the trunk and produces a fire sear or scar. Each subsequent fire enlarges the burned spot until the tree finally succumbs. The yellow pine in the stands east of the Cascades is much more resinous than on the western slopes, and is therefore much more exposed to destruction by fire. The custom of the Indians of peeling the yellow pine at certain seasons of the year to obtain the cambium layer which they use for food, is in some localities a fruitful contributory cause toward destruction of the yellow pine by fire. They do not carry the peeling process far enough to girdle the tree, but they remove a large enough

piece of bark to make a gaping wound which never heals over and which furnishes an excellent entrance for fire. Throughout the forests on the Klamath Reservation trees barked in this manner are very common. Along the eastern margin of Klamath Marsh they are found by the thousands.

The stands of yellow pine which occur so plentifully along the middle elevations on the western slopes of the Cascades are rarely pure growths, but are more or less mixed with other species, among which red and white firs form a large percentage. These kinds commonly occur in scattered aggregations and have not nearly the fire-resisting capacity which distinguishes the yellow pine. When a fire comes along such aggregations become centers for very hot fires, which easily wipe out the adjacent yellow pine. The greatest menace to the yellow-pine forest west of the Cascades, outside of logging practices, is found in these scattered aggregations of poor fire-resisting trees.

The sugar pine has not the fire endurance possessed by the yellow pine. Its usual habitat among masses of red and white fir contributes to its destruction. The root system and the lower portion of the trunk are far more resinous than the balance of the tree and are therefore the most vulnerable. In stands of sugar pine swept by fire one always finds large numbers of trees of this species prostrate on the ground, the lower 6 or 8 feet of the trunk burned away and great gaping holes in the ground where the fire has followed the root system. Often only the heartwood burns out in the lower 8 or 10 feet and one sees huge trees 6 to 8 feet in diameter standing on a few thin stilts of sapwood. Forest fires are especially destructive to this species, not alone in the burning of the large and mature growth, but also because the tree appears incapable of reproducing itself to any great extent on burned-over areas, if one may judge from the few seedlings growing on such tracts.

The white pine is easily destroyed by fire. Its bark is thin, its fire endurance is low, and it always grows where the stands of other species are dense and where the forest floor is covered with a maximum of humus and litter. There is but little of the species in the region. Freedom from fires will enlarge its range to some extent; the reverse will contract it with the result that the species will ultimately become extinct in this region.

The lodgepole pine resists fire poorly. The variety which has its habitat on dry ground is the worst in this respect; the swamp variety has greater endurance, but neither of them possesses it in any considerable degree. The bark is thin and in the upland variety plentifully supplied with small resin particles. Fires most generally kill the tree by burning the bark and the foliage. The trunk remains standing until wind and snow throw it down.

The red fir endures fire to a moderate degree. The mature tree has a greater power in this respect than has the sapling or middle-aged individual. This is due, as much as to any other cause, to the circumstance that in the young and middle-aged tree the resin vesicles in the bark are surficial or nearly so, while in the veterans the resin vesicles have become obliterated or are sunk so deeply in the bark on the lower portion of the trunk that the heat of an ordinary forest fire is not sufficient to flame them. The red fir has suffered severely from both ancient and modern fires. While at the present time it covers a larger area on the western side of the Cascades than any other single species, it formerly was even more abundant. The restriction of its area is partly due to forest fires, which have promoted the growth of other species, chiefly the white fir, at the expense of the former red-fir tracts. Its reproduction, while abundant enough on certain areas, is yet, on the whole, indefinite. A burned-over red-fir tract is almost as likely to grow up to a stand of white fir as to the other.

The white fir resists fire poorly, being in this respect on a par with the great silver fir of the regions farther northward. As a matter of fact there are no essential differences between the great silver fir and the white fir as it grows here, either botanically or in the timber qualities or in its general vegetative behavior. Like the red fir, the young white fir is more susceptible to fire than are the veterans, and for the very same reason, namely, the relative position of the resin vesicles of the bark. The white fir has been badly burned both on the eastern and on the western slopes of the range. In fires among stands of timber where it forms any considerable percentage of the growth it is sure to suffer more damage in proportion to its numbers than any of the other species. Its reproduction is generally good, but in some localities on the eastern side of the range, as T. 32 S., R. 6 E., brush growths are replacing burned or partially burned stands of the white fir.

The noble fir holds an intermediate position between the red and white firs as regards its fire-resisting capacity. Its tendency is toward small aggregations in the midst of mixed growths of other species; but occasionally one meets with considerable stands of nearly pure growth, as along the higher elevations of the Siskiyou Mountains, in T. 41 S., R. 2 W. to 1 E., inclusive. The habit of the species of growing in such clumps or dense aggregations invites more certain destruction by fire than would be the case if it grew singly or scattered. Its reproduction after fires is moderate or below the average of the other species of firs.

The alpine hemlock succumbs easily to fire. Except in very old individuals the bark is thin and is easily scorched beyond recovery. Its habit of growth inclines strongly toward stands and groupings of pure growth or nearly so. Often, however, it forms a mixed growth,

with the noble fir as the other chief component. These groupings and mixtures aid in its destruction by fire. Trees of the species have the remarkable habit, after being fire killed, of first decaying half way between the top and the ground. This causes the upper portion of the tree to break off with the first strong wind, and there soon piles up a vast quantity of highly inflammable litter, which insures the complete destruction of all forest on that area when fire reaches it. The destruction that has been wrought in the mixed stands of noble fir and alpine hemlock has been enormous. Especially has this been the case on the upper slopes of the Rogue River-Umpqua divide, where heavy growths of such mixed stands frequently carry as much as 70,000 feet B. M. merchantable timber per acre. Many such tracts on the Umpqua ridges have been laid waste by conflagrations of modern times, which have left nothing of the former forest but dead and blackened stumps.

The western hemlock and Engelmann spruce are both thin-barked trees and stand fire poorly. They are not abundant in the region, and as their reproductive powers are not very good the area occupied by them is continually being restricted by successive fires.

The incense cedar is deficient in fire-resisting qualities. The larger and even the younger trees of the species are almost always rotten at the core. If fire gains entrance to the dry, punky interior the tree is destroyed.

The madroña succumbs easily to fire. It, however, springs up again from the root.

The oaks in the region resist fire well, notwithstanding the fact that more than 50 per cent have a rotten and hollow interior. Their ability to withstand fire is, however, more largely due to environment than to inherent qualities. Their growth is always open and scattered and their habitat is along the lowest elevations, where there is a minimum of combustible material on the ground to support a hot and lasting fire.

CASCADE RANGE FOREST RESERVE AND ADJACENT REGIONS.

BOUNDARIES OF CASCADE RANGE FOREST RESERVE.

Beginning at the meander corner at the intersection of the range line between ranges six (6) and seven (7) east, township two (2) north, Willamette meridian, Oregon, with the mean high-water mark on the south bank of the Columbia River in said State; thence northeasterly along said mean high-water mark to its intersection with the township line between townships two (2) and three (3) north; thence easterly along said township line to the northeast corner of township two (2) north, range eight (8) east; thence southerly along the range line between ranges eight (8) and nine (9) east, to the southwest corner of township two (2) north, range nine (9) east; thence westerly along the township line between townships one (1) and two (2) north, to the northwest corner of township one (1) north, range nine (9) east; thence southerly along the range line between ranges eight (8) and nine (9) east, to

the southwest corner of township one (1) north, range nine (9) east; thence easterly along the base line to the northeast corner of township one (1) south, range ten (10) east; thence southerly along the range line between ranges ten (10) and eleven (11) east, to the southeast corner of township four (4) south, range ten (10) east; thence westerly along the township line between townships four (4) and five (5) south, to the southwest corner of township four (4) south, range nine (9) east; thence southerly along the west boundary of township five (5) south, range nine (9) east, to its intersection with the west boundary of the Warm Springs Indian Reservation; thence southwesterly along said Indian reservation boundary to the southwest corner of said reservation; thence southeasterly along the south boundary of said Indian reservation to a point on the north line of section three (3), township twelve (12) south, range nine (9) east, where said boundary crosses the township line between townships eleven (11) and twelve (12) south, range nine (9) east; thence easterly to the northeast corner of township twelve (12) south, range nine (9) east; thence southerly along the range line between ranges nine (9) and ten (10) east, to the southeast corner of township thirteen (13) south, range nine (9) east; thence westerly along the third (3rd) standard parallel south, to the northeast corner of township fourteen (14) south, range nine (9) east; thence southerly along the range line between ranges nine (9) and ten (10) east, to the southeast corner of township fifteen (15) south, range nine (9) east; thence easterly along the third (3rd) standard parallel south, to the northeast corner of township sixteen (16) south, range nine (9) east; thence southerly along the range line between ranges nine (9) and ten (10) east, to the southeast corner of township twenty (20) south, range nine (9) east; thence easterly along the fourth (4th) standard parallel south, to the northeast corner of township twenty-one (21) south, range nine (9) east; thence southerly along the range line between ranges nine (9) and ten (10) east, to the southeast corner of township twenty-three (23) south, range nine (9) east; thence westerly along the township line between townships twenty-three (23) and twenty-four (24) south, to the southeast corner of township twenty-three (23) south, range six (6) east; thence southerly along the range line between ranges six (6) and seven (7) east, to the southwest corner of township twenty-five (25) south, range seven (7) east; thence westerly along the fifth (5th) standard parallel south, to the point for the northwest corner of township twenty-six (26) south, range seven (7) east; thence southerly along the surveyed and unsurveyed west boundaries of townships twenty-six (26), twenty-seven (27), twenty-eight (28), twenty-nine (29), and thirty (30) south, to the southwest corner of township thirty (30) south, range seven (7) east; thence westerly along the unsurveyed sixth (6th) standard parallel south, to the point for the northwest corner of township thirty-one (31) south, range seven and one-half ($7\frac{1}{2}$) east; thence southerly along the surveyed and unsurveyed west boundaries of townships thirty-one (31), thirty-two (32), and thirty-three (33) south, range seven and one-half ($7\frac{1}{2}$) east, to the southwest corner of township thirty-three (33) south, range seven and one-half ($7\frac{1}{2}$) east; thence easterly along the township line between townships thirty-three (33) and thirty-four (34) south, to the northeast corner of township thirty-four (34) south, range six (6) east; thence southerly along the east boundaries of townships thirty-four (34) and thirty-five (35) south, range six (6) east, to the point of intersection of the east boundary of township thirty-five (35) south, range six (6) east, with the west shore of Upper Klamath Lake; thence along said shore of said lake to its intersection with the range line between ranges six (6) and seven (7) east, in township thirty-six (36) south; thence southerly along the range line between ranges six (6) and seven (7) east, to the southeast corner of township thirty-seven (37) south, range six (6) east; thence westerly along the township line between townships thirty-seven (37) and thirty-eight (38) south, to the southwest corner of township thirty-seven (37) south, range four (4) east; thence northerly along the range line between ranges three (3) and four (4) east, to the

northwest corner of township thirty-six (36) south, range four (4) east; thence easterly along the eighth (8th) standard parallel south, to the southwest corner of township thirty-five (35) south, range four (4) east; thence northerly along the range line between ranges three (3) and four (4) east, to the southwest corner of township thirty-one (31) south, range four (4) east; thence westerly along the township line between townships thirty-one (31) and thirty-two (32) south, to the southwest corner of township thirty-one (31) south, range one (1) east; thence northerly along the surveyed and unsurveyed Willamette meridian to the northwest corner of township twenty (20) south, range one (1) east; thence easterly along the township line between townships nineteen (19) and twenty (20) south, to the northeast corner of township twenty (20) south, range one (1) east; thence northerly along the range line between ranges one (1) and two (2) east, to the northwest corner of township eighteen (18) south, range two (2) east; thence easterly along the township line between townships seventeen (17) and eighteen (18) south, to the southeast corner of township seventeen (17) south, range two (2) east; thence northerly along the range line between ranges two (2) and three (3) east, to the southwest corner of township seventeen (17) south, range three (3) east; thence easterly along the surveyed and unsurveyed township line between townships seventeen (17) and eighteen (18) south, to the point for the southeast corner of township seventeen (17) south, range four (4) east; thence northerly along the surveyed and unsurveyed range line between ranges four (4) and five (5) east, subject to the proper easterly or westerly offsets on the third (3rd), second (2nd), and first (1st) standard parallels south, to the northwest corner of township five (5) south, range five (5) east; thence easterly along the township line between townships four (4) and five (5) south, to the southeast corner of township four (4) south, range six (6) east; thence northerly along the range line between ranges six (6) and seven (7) east, to the northwest corner of township four (4) south, range seven (7) east; thence easterly along the township line between townships three (3) and four (4) south, to the southwest corner of section thirty-four (34), township three (3) south, range seven (7) east; thence northerly along the surveyed and unsurveyed section line between sections thirty-three (33) and thirty-four (34), twenty-seven (27) and twenty-eight (28), twenty-one (21) and twenty-two (22), fifteen (15) and sixteen (16), nine (9) and ten (10), and three (3) and four (4), to the northwest corner of section three (3) of said township and range; thence easterly along the surveyed and unsurveyed township line between townships two (2) and three (3) south, to the point for the southeast corner of township two (2) south, range eight (8) east; thence northerly along the unsurveyed range line between ranges eight (8) and nine (9) east, to the southeast corner of township one (1) south, range eight (8) east; thence westerly along the township line between townships one (1) and two (2) south, to the southeast corner of section thirty-four (34), township one (1) south, range eight (8) east; thence northerly along the section line between sections thirty-four (34) and thirty-five (35), twenty-six (26) and twenty-seven (27), and twenty-two (22) and twenty-three (23), to the northeast corner of section twenty-two (22); thence westerly along the section line between sections fifteen (15) and twenty-two (22), to the southeast corner of section sixteen (16); thence northerly on the section line between sections fifteen (15) and sixteen (16), to the point for the northeast corner of section sixteen (16); thence westerly along the section line between sections nine (9) and sixteen (16) to the southeast corner of section eight (8); thence northerly along the section line between sections eight (8) and nine (9) and four (4) and five (5) to the northwest corner of section four (4), township one (1) south, range eight (8) east; thence easterly along the base line to the southeast corner of section thirty-three (33), township one (1) north, range eight (8) east; thence along the unsurveyed section lines northerly to the point for the northeast corner of section thirty-three (33), westerly to the point for the northeast corner of section thirty-two (32), northerly to the

point for the northeast corner of section eight (8), westerly to the point for the southwest corner of section six (6); thence northerly along the unsurveyed range line between ranges seven (7) and eight (8) east, to the point for the northwest corner of township one (1) north, range eight (8) east; thence westerly along the unsurveyed township line between townships one (1) and two (2) north, to the northwest corner of township one (1) north, range seven (7) east; thence northerly along the surveyed and unsurveyed range line between ranges six (6) and seven (7) east, to the meander corner at its intersection with the mean high-water mark on the south bank of the Columbia River, the place of beginning.

CHARACTER OF REGION.

The area embraced in this examination covers 838,400 acres, situated within the boundaries of the Cascade Range Forest Reserve. It comprises most of the reserve south of the north line of T. 28 S., the exceptions being T. 28 S., Rs. 1, 2, and 3 E., and T. 29 S., Rs. 1 and 2 E.

From the north line of T. 38 S., which forms the south boundary of the reserve, to the south line of T. 31 S. the reserve has a width of 18 miles, comprising three ranges of townships, namely, 4, 5, and 6 E., with the crest line of the Cascade Range nearly in the center of the area. North of the south line of T. 31 S. the boundaries of the reserve are extended westward to the Willamette meridian line and eastward a distance of about 4 miles, the westward enlargement covering the drainage from the Umpqua-Rogue River divide from the west line of T. 31 S. to the junction of the divide with the Cascade Range.

The reserve in this region consists of rocky and mountainous tracts, with altitudes varying from 4,500 to nearly 10,000 feet above sea level. The Cascades and a portion of the Umpqua-Rogue River divide, near its junction with the former range, are of volcanic origin, the crest lines studded at frequent intervals with extinct volcanic cones and peaks, the slopes covered with thick deposits of lava, some very ancient, some comparatively recent, and in many localities overlain by vast sheets of fine or coarse pumice ejected from nearby vents. In the central and southern portions the Umpqua-Rogue River divide is of volcanic nature only in places, much of it being made up of the more ancient porphyry core which lies at the base of the Cascades.

Most of the water flowing from the region finds its way into Rogue River. On the northern slopes of the Umpqua-Rogue River divide a small quantity empties into the South Umpqua. The western boundaries of the reserve are so arranged that they very accurately cover the heads of all the more important affluents of the Rogue River system. South of T. 33 S. most of the streams head in very large springs, which suddenly burst out from under thick lava flows; north of that township the stream heads lie in marshy areas or originate in small and scattered springs. The canyons are generally narrow and rocky. The larger ones have repeatedly been dammed by lava flows, through which the streams have cut fresh channels, with resultant gorges and falls. In the pumice-covered areas many of the



A. LOGGING TRACKS AND LOAD, NEAR SNOW, T. 40 S., R. 5 E.



B. METHOD USED IN HAULING LOGS TO THE LOGGING RAILROAD AT SNOW, T. 40 S., R. 5 E.

streams lie in narrow canyons, sunk 400 to 500 feet in loose puniceous material.

On the eastern side of the Cascades the reserve boundaries cover the heads of a number of small creeks. With the exception of Anna Creek and Wood River, none of them are of any importance. The waters of these two streams are utilized for irrigation purposes.

The region is essentially a forested one. It contains a few heavily timbered tracts, a considerable area, in the aggregate, lightly forested, and large tracts that carry only thin and scattered groups of trees. With the exception of rocky tracts naturally without soil, areas above timber line, lake, and marshes, not a large area collectively, the thinly wooded and nonforested tracts owe their origin in ninety-nine cases out of a hundred to forest fires.

All of the three general forest types previously described in this report are found in the reserve. The yellow-pine type is sparingly represented. The red-fir and the alpine-hemlock types are abundant and of characteristic composition.

The Cascade Range Forest Reserve in its entirety possesses extremely varied features of topography and forest conditions. Until more extended examinations shall have been made it can not be treated in a manner to satisfactorily show the correlation of its various portions. Pending such examination, the region covered in the field work during the season of 1899 is here described by minor subdivisions, the township having been chosen as the unit of area.

In the tabulations of areal and timber estimates accompanying each township is to be noted that the term "forested areas" includes all tracts carrying an arborescent growth, which, in many places where fires have badly burned the forest, is often very thin or scattering, or at subalpine elevations, where rocky soil and severe climatic conditions negative the existence of a continuous forest, consists of trees set far apart, with bare ground between. In the term "nonforested" it has been the aim to include all tracts containing 20 acres and upward wholly bare of arborescent growth. Tracts with less than 20 acres are included under "forested areas" (Pl. LXXXI, *A* and *B*).

DETAILED DESCRIPTIONS.

TOWNSHIP 28 SOUTH, RANGE 5 EAST.

This township is situated on the summit of the main range of the Cascades. Its southern and central portions consist of an almost level punice plain. The northern sections comprise high ridges, which here and there rise into prominent peaks, all of which are extinct volcanic cones. These ridges and peaks constitute the junction point of the main range of the Cascades and the Umpqua-Rogue River divide.

The southern areas have no visible run-off. The northern discharge limited quantities of water partly by way of tributaries to

the South Umpqua, partly into Diamond Lake, whence it finds its way to the North Umpqua.

There are no agricultural lands, and no mineral-bearing areas are known in the township.

The grazing lands consist of fire glades along the west shore of Diamond Lake, whose southern end barely touches the township. The glades constitute in part the great sheep ranges of the high Cascades, which extend northward from this and the next township on the east.

The forest is of the alpine-hemlock type. The southern and central portions are covered with stands of lodgepole pine, all reforestations after fires and representative of all ages of burns from one hundred and fifty years ago up to the present time. There is no portion of these or of the heavier stands of alpine hemlock and noble fir in the northern sections of the township that have not been visited by fire within the past forty-five years. Reforestations consist wholly of lodgepole pine as the first growth. In some places on warm southern declivities brush growth comes in after fires. In other localities a grass and sedge sward covers the ground. It is clearly evident that many of the fires have been set for the purpose of promoting these grass growths and enlarging the possible sheep range. It is also noticeable that wherever fires have been kept down for four or five years there is a gradual return to forest and a disappearance of the grass. As before remarked, it is essential to the maintenance of the stability of the waterheads in the pumice-covered regions of the high Cascades that the pumice cover be disturbed as little as possible. To this end reforestations should be encouraged in every possible manner, even at the expense of destroying the grass and sedge swards by allowing the forest to regain possession.

The mill timber is of poor quality and is confined to the northern sections of the township, where it is inaccessible for logging operations.

Timbered and other areas in T. 28 S., R. 5 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area.....	18,000
Logged area	None.

Total stand of timber in T. 28 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
White pine	16.7	5,000,000	5,000,000
Noble fir	66.7	20,000,000	25,000,000
Alpine hemlock.....	16.6	5,000,000	10,000,000
Total		30,000,000	40,000,000

Composition of forest in T. 28 S., R. 5 E., Oregon, including all species with diameters of 4 inches and upward.

	Per cent.
Lodgepole pine.....	80
Noble fir.....	10
Alpine hemlock.....	9.2
White pine.....	.8

TOWNSHIP 28 SOUTH, RANGE 6 EAST.

The areas comprised within the lines of this township are situated on the summit of the main range of the Cascades. The southern and central areas consist of a nearly level pumice-covered region. The northern sections are rocky with numerous ridges stretching westward from Mount Thielsen, an extinct volcanic center occupying the northeast corner of the township. About two sections in the northeast corner are comprised in Diamond Lake, and an additional two sections in a series of swamps at its southern extremity. There is practically no visible drainage originating in the township. A large stream heading in T. 28 S., R. 4 E., flows through it and empties into Diamond Lake.

There are no agricultural and no mineral lands in the township. There is a large amount of grazing land, consisting in part of fire glades and in part of 1,200 acres of marsh and overflowed land at the south end of Diamond Lake. The dry tracts are all used for sheep range.

The forest consists of stands of alpine-hemlock type. Ninety per cent of it is composed of lodgepole-pine reforestations. Some of these stands date back to the Indian occupancy, others are the result of fires set by the white man. All of the forest is fire marked. Reforestations after fires are invariably composed of lodgepole pine. Repeated conflagrations and total destruction of the forest bring grass and sedge growths. Fires in the township have been fewer during the past four or five years than formerly, and most of the grassy tracts are slowly reforesting.

The mill timber is of poor quality and is confined to the spurs of Mount Thielsen. It exists in small scattered bodies and is inaccessible for logging operations.

Forested and other lands in T. 28 S., R. 6 E., Oregon.

	Acres.
Forested area.....	18,000
Badly burned area.....	15,000
Nonforested area (lake, swamps, bare rocks, etc).....	5,040
Logged area.....	None.

Total stand of timber in T. 28 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Noble fir	60	3, 000, 000	3, 000, 000
Alpine hemlock	40	2, 000, 000	2, 000, 000
Total		5, 000, 000	5, 000, 000

Composition of forest in T. 28 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Lodgepole pine	95
Noble fir	3
Alpine hemlock	2

TOWNSHIP 28 SOUTH, RANGE 6½ EAST.

This township is situated wholly on the eastern slope of the Cascades. The northwestern portion consists of steep spurs radiating from Mount Thielsen; the central and southern tracts comprise a long gradual slope from the summit of the range to its eastern foot. The township is only partly included in the forest reserve, the area outside the reserve containing about 16,000 acres, but included in the estimates is a narrow strip adjoining the Klamath Indian Reservation, which brings the acreage up to that of a full township.

The township is drained by three small creeks rising in springs and marshy places at the foot of the range and sinking in the pumice deposit in the adjoining township to the east.

No agricultural, grazing, or mineral lands occur on the tract.

The forest consists of stands of yellow-pine and alpine-hemlock types. The alpine-hemlock type here is composed almost entirely of lodgepole-pine stands, which are reforestations after fires, and occupy the western half of the township. The eastern half is covered with yellow pine of mature age, running from 5,000 to 10,000 feet B. M. per acre.

The forest is fire marked everywhere in the township. Seventy-five per cent of the yellow pine is fire seared in the lower 3 or 4 feet of the trunk. Reforestations are moderate, but the burned tracts in the yellow pine show a tendency to grow up to lodgepole pine.

The region carrying the mill timber is easy of access for logging in any direction except over the range from the west.

The areal and timber estimates are as follows:

Forested and other areas in T. 28 S., R. 6½ E., Oregon.

	Acres.
Forested area	23, 040
Badly burned area	12, 000
Logged area	None.

Total stand of timber in T. 28 S., R. 6½ E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	146, 000, 000	161, 280, 000

Composition of forest in T. 28 S., R. 6½ E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Lodgepole pine	75
Yellow pine	25

TOWNSHIP 28 SOUTH, RANGE 7 EAST.

This township is situated east of the main range of the Cascades, and consists chiefly of easy slopes or nearly level tracts. The surface is covered with a soil of pumice detritus.

The entire township is fire marked. The complexion of the present forest growth is largely owing to fires during the exclusive Indian occupancy. Result of fires is lodgepole-pine growths where sufficient soil moisture exists; in other localities growths of scattered desert shrubs, tufts of grass, or small and insignificant weeds.

The mill timber is mostly confined to the southwestern areas. It is mostly fire scarred on the lower one-quarter of the trunk. It otherwise is fair in quality and is easy of access. Owing to suppression of young growth by repeated fires it is largely composed of standards and veterans.

Forested and other areas in T. 28 S., R. 7 E., Oregon.

	Acres.
Forested area	23, 040
Logged area	None.

Total stand of timber in T. 28 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	20, 000, 000	26, 880, 000

Composition of forest in T. 28 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Lodgepole pine	88
Yellow pine	12

TOWNSHIP 28 SOUTH, RANGE 8 EAST.

This township is situated east of the Cascades, and comprises a nearly level tract of country. The general flatness is relieved here and there by low benches, marking the recession of what now constitutes Klamath Marsh. The soil is uniformly a pumice detritus, fine on the surface as a rule, but composed of irregular blocks and fragments below.

The forest is chiefly lodgepole pine. The mill timber, which is all yellow pine, occurs singly or in very small groups scattered throughout the body of lodgepole pine. It is poor in quality, and is composed wholly of standards and veterans. It clearly is a remnant of a much more extensive stand which covered the region anterior to the lodgepole growths. The preponderance of the latter species is wholly due to forest fires during the Indian occupancy, that is to say, before the coming of the white man, as this township lies within the Klamath Indian Reservation; in part.

The lodgepole-pine growth has been reburned here and there within recent times. The result of such reburning is, almost invariably, the creation of sparsely grassed, absolutely nonforested areas.

Forested areas in T. 28 S., R. 8 E., Oregon.

	Acres.
Forested area	23, 040
Logged area	None.

Total stand of timber in T. 28 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	1, 500, 000	1, 500, 000

Composition of the forest in T. 28 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Lodgepole pine	99.9
Yellow pine .....	.1

TOWNSHIP 29 SOUTH, RANGE 3 EAST.

The northern and central portions of this township consist of high ridges belonging to the northern slopes of the Umpqua-Rogue River divide. The southern areas comprise tracts with comparatively low relief, constituting parts of the upper drainage basin of the North Fork of Rogue River. A deposit of pumice covers the southern sections, while the northern have only a light covering of this material or, in many places, are entirely free of it.

The volume of run-off from the township is very large. Most of it is discharged into the South Umpqua, a smaller portion going

into Rogue River through the north fork of this stream. The Umpqua-Rogue River divide that here supplies most of the run-off is not of the same volcanic formation as the Cascades. It evidently is much less fissured and therefore sheds a great deal more of the precipitation as visible drainage.

The township contains no agricultural land. Mineral-bearing ground has been discovered in various localities along the crest and slopes of the Umpqua-Rogue River divide. Along the summits and flanks of the higher ridges is a considerable quantity of grazing land which is utilized for sheep range. The grazing areas consist wholly of fire glades or of rocky slopes which have not reforested after fires.

The forest consists of stands of red-fir and alpine-hemlock types. It is fire marked throughout.

Reforestation are composed chiefly of lodgepole pine, in the stands of which the grass and sedge swards that came in after the fires persist for a long time. In some localities, especially where fires have been particularly destructive, brush growths, composed of the vellum-leaved ceanothus, occupy the ground.

The mill timber is of poor quality and is generally defective, owing to the numerous fires that have swept through the township during the past 40 or 45 years. Most of it is inaccessible for logging operations; but a small quantity in the southern sections can be reached by way of the valley of the North Fork of Rogue River.

Forested and other areas in T. 29 S., R. 3 E., Oregon.

	Acres.
Forested area	23, 040
Badly burned area	10, 000
Logged area	None.

Total stand of timber in T. 29 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
White pine	10	4, 000, 000	4, 000, 000
Red fir	62. 5	25, 000, 000	40, 000, 000
White fir	12. 5	5, 000, 000	10, 000, 000
Alpine hemlock	15	6, 000, 000	11, 000, 000
Total		40, 000, 000	65, 000, 000

Composition of forest in T. 29 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Red fir	50
White fir	10
White pine	5
Alpine hemlock	30
Lodgepole pine	5

TOWNSHIP 29 SOUTH, RANGE 4 EAST.

The northern half of this township is situated on the northern slopes of the Umpqua-Rogue River divide, and consists of high, rocky ridges. The southern half comprises pumice-covered levels intersected by low ridges of lava and furrowed by numerous small deep canyons, which form the upper heads of the eastern tributaries of the North Fork of Rogue River.

The run-off from the northern half of the township is large in volume, and flows into the South Umpqua. The quantity originating in the other half is of moderate volume, and empties into Rogue River through the North Fork.

There are no agricultural lands in the township. Mineral-bearing areas have been discovered along the northern slopes of the Umpqua-Rogue River divide, and some claims have been located. The region, in common with other mineral ground along this divide, carries values only in gold. The thinly wooded areas on the summits of the Umpqua ridges constitute the grazing lands of the township. Some of them are naturally thinly forested or wooded; others are grassed over as the result of fires.

The forest consists of red-fir and of alpine-hemlock stands. Most of the stands are reforestations; some after fires since the white man's occupancy; others after fires that burned while the Indians were in possession. Sixty per cent of the reforestations are composed of lodgepole pine; the balance of alpine hemlock and white pine.

The mill timber is poor in quality and of small dimensions throughout. It is inaccessible for logging operations.

The areal and timber estimates for the township are as follows:

Forested and other areas in T. 29 S., R. 4 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area	18,000
Logged area	None.

Total stand of timber in T. 29 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B.M.</i>
White pine	31.3	5,000,000	5,000,000
Red fir	50	8,000,000	10,000,000
White fir	18.7	3,000,000	10,000,000
Total	-----	16,000,000	25,000,000

Composition of forest in T. 29 S., R. 4 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Lodgepole pine.....	80
Red fir.....	8
White fir.....	5
White pine.....	3
Alpine hemlock.....	4

TOWNSHIP 29 SOUTH, RANGE 5 EAST.

This township comprises areas situated on the summit and immediate western slopes of the main range of the Cascades. Most of the tract consists of level or gently sloping areas, all very deeply pumice covered. In the northern portion of the township there are four or five sections of high, mountainous ridges belonging to the Umpqua-Rogue River divide.

The water supply of this township is trifling in amount. Most of the precipitation sinks in the immense sheet of pumice and disappears. The heads of two of the lesser tributaries of the North Fork of Rogue River lie in the central portions of the township. Each has cut out a deep but narrow canyon in the pumice. It is evident that in late years these streams have cut into the pumice at a more rapid rate than they formerly did. The widespread destruction of the growing forest by fire has no doubt contributed to this acceleration. If it be desirable to prevent the vast blanket of pumice along the summit and higher slopes of the Cascades from transfer to the low-lying valleys of the agricultural districts, it is necessary that everything tending toward the loosening of the pumice surface should be avoided.

The forest is of the alpine-hemlock type. It consists of lodgepole pine with small groups of alpine hemlock and noble fir scattered here and there among the lodgepole. The species represent reforestation after fires. This region was burned periodically during the Indian occupancy, as the many different ages represented in the lodgepole-pine stands prove. But when the white man came into the region the areas in this particular township were covered with a uniform stand of the species. During the past forty or forty-five years the timber has been burned in many localities and the subsequent reforestations have again been burned. The region is too high in altitude to permit the growth of much brush. After a fire one of three things happens; either lodgepole pine comes as the first forest growth, or grasses and sedges form a thin, interrupted sward, or the ground remains bare of all vegetation. It is impossible to predict beforehand which one of the three phases will appear. It all depends on the extent to which the ratio of soil moisture has been disturbed and changed.

The township contains no mill timber. There are no agricultural, grazing, or mineral lands in the township.

The areal estimates are as follows:

Forested and other areas in T. 29 S., R. 5 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area	18,000
Logged area	None.

TOWNSHIP 29 SOUTH, RANGE 7 EAST.

This township is situated on the eastern side of the Cascades and consists of nearly level plains in the eastern portions and of gentle slopes, rising toward the Cascades, in the western. The soil is uniformly a pumice sand.

The forest in the eastern areas consists of lodgepole pine, reforestation after ancient fires. In the western sections of the township the timber is yellow pine mixed with lodgepole. The western areas are fire marked throughout. The lodgepole in the eastern portions does not form a solid stand. It is everywhere broken by small, scantily grassed tracts, which for some reason, possibly lack of soil humidity, do not reforest.

The mill timber is of fair quality, and is mostly composed of stand-ards and veterans. Reproduction in the yellow-pine stands is good where fire has not run for a number of years.

Forested and other areas in T. 29 S., R. 7 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area	None.
Logged area	None.

Total stand of timber in T. 29 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan prac- tice.
	Per cent.	Fect B. M.	Fect B. M.
Yellow pine	100	68,540,000	80,640,000

Composition of forest in T. 29 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent
Lodgepole pine	90
Yellow pine	10

TOWNSHIP 29 SOUTH, RANGE 8 EAST.

This township consists of nearly level, pumice-covered plains, situated between the eastern foot of the Cascades and the northern end of Klamath Marsh.

The forest is almost exclusively a lodgepole-pine growth, here, as in most places along the eastern base of the Cascades, representing a reforestation after ancient fires. The nonforested tracts are sparsely grassed areas that have failed to reforest.

The mill timber consists mostly of single trees or of groups of a dozen or two scattered among the lodgepole. It is inferior in quality, and is practically worthless for commercial purposes.

Forested and other areas in T. 29 S., R. 8 E., Oregon.

Forested area	Aeres.
Nonforested area (meadows)	20,000
Badly burned area	3,040
Logged area	None.

Total stand of timber in T. 29 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	6,000,000	6,000,000

Composition of forest in T. 29 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

Lodgepole pine	Per cent.
Yellow pine	99.9
	0.1

TOWNSHIP 30 SOUTH, RANGE 2 WEST.

This township is estimated from information, as it was not personally examined.

Area forested and wooded	Aeres.
	23,040

Total stand of timber in T. 30 S., R. 2 W., Oregon.

Yellow pine	Feet B. M.
Red fir	45,000,000
Sugar pine	60,000,000
Incense cedar	18,000,000
Total	123,000,000

TOWNSHIP 30 SOUTH, RANGE 1 WEST.

This township is estimated from information, as it was not personally examined.

Area forested and wooded	Aeres.
	23,040

Total stand of timber in T. 30 S., R. 1 W., Oregon.

	Feet B. M.
Yellow pine	25,000,000
Red fir	165,000,000
Sugar pine	} 10,000,000
Incense cedar	
Total	200,000,000

TOWNSHIP 30 SOUTH, RANGE 1 EAST.

This township is mostly on the northern slopes of the Umpqua-Rogue River divide, a small portion in the northwest corner covering spurs projecting southward from the ridges between the North Umpqua and South Umpqua excepted. In some places the township consists of long steep spurs; in others, especially in the southeast corner, the ridges have broad summits and easy slopes.

The region contains no grazing or agricultural lands. It is more or less mineral bearing throughout most of its areas, but as yet there are no mines or prospects in process of development.

This township has a large run-off. It originates in numerous small creeks that empty into the South Umpqua, which flows through the northwest corner of the township.

The forest consists of stands of yellow-pine, red-fir, and alpine-hemlock types. The yellow-pine type occurs on ridges of low elevation bordering the South Umpqua; the alpine-hemlock type on summits and high slopes along the Umpqua-Rogue River divide; the red-fir type in the canyons and on all of the areas situated at middle elevations.

The stand of timber is heavy throughout, especially along the flanks of the summit of the Umpqua-Rogue River divide, notwithstanding the fact that 50 per cent of all the timber has been visited by fire. Reforestations are abundant and are chiefly composed of red fir.

The mill timber is of good quality. The red-fir, noble-fir, and alpine-hemlock stands are largely composed of standards and veterans. The last two species form very heavy stands on the broad summits and spurs in the southeastern sections of the township. With the exception of the main valley of the South Umpqua, the forest is inaccessible for logging operations.

Forested and other areas in T. 30 S., R. 1 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area	2,500
Logged area	None.

Total stand of timber in T. 30 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	19.1	45,000,000	59,685,000
Sugar pine.....	2.8	6,000,000	7,958,000
Red fir	59.7	131,000,000	250,677,000
White fir	1.5	3,000,000	7,958,000
Noble fir	10	20,000,000	39,790,000
Alpine hemlock.....	6.9	15,000,000	31,832,000
Total.....		220,000,000	397,900,000

Composition of forest in T. 30 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	20
Sugar pine.....	.4
Red fir	50
White fir	3
Noble fir.....	10
Alpine hemlock.....	6.5

TOWNSHIP 30 SOUTH, RANGE 2 EAST.

This township is situated partly on the northern and partly on the southern slopes of the Umpqua-Rogue River divide, which almost bisects the township, entering near the northeast corner and leaving near the southwest. The portion of the crest of the divide which lies within the township generally is rocky, narrow, and very tortuous, and slopes abruptly on either side to canyons of great depth. About midway in the township the crest expands into Abbots Butte, a mass of volcanic rock with an elevation of 6,500 feet. The summit of the butte is flattened, with a projecting central, rocky boss. It is about three-fourths of a mile in width and breaks off on all sides, except at one point in the northwest corner, with a precipitous wall of rock 400 to 1,500 feet in height. The sections of the township situated on either side of the Umpqua-Rogue River divide are filled with steep, precipitous spurs.

The volume of water discharged by the stream in the southern portions of the township is small and empties into the North Fork of Rogue River. The outflow from the northern areas is large and enters the South Umpqua. The areas draining into this stream are copiously supplied with large, springy, marshy tracts, situated on the sloping hillsides and at the heads of the various creeks.

The township has no agricultural land. Most of its areas are known to be mineralized, and four or five mineral claims are located on the

Umpqua-Rogue River divide a mile west of Abbots Butte. There is no development work in progress on these claims or on any others in the township.

The grazing lands consist of glades scattered throughout the summit areas and higher slopes of the Umpqua-Rogue River divide. These glades are mostly due to forest fires burning off the timber. A small number of cattle occasionally stray up here from the lowlands of the Rogue River Valley in late summer. The summit of Abbots Butte and most of the high slopes of the divide east and north of this point are used for pasturing sheep.

The forest consists of stands belonging to the three types of the region. The yellow-pine type occurs chiefly in the southwestern areas. In the northern sections there also are considerable quantities of yellow pine, but it scarcely forms a type, the species and its associates existing as scattered trees or in small groups among the red-fir stands. The alpine hemlock is the forest along the summit and higher slopes of the Umpqua-Rogue River divide. It also extends downward on the northern declivities of the divide to the 4,000-foot contour line, following the numerous wet canyon bottoms and slopes. The stands of the type are often of great density, reaching 50,000 to 75,000 feet B. M. per acre. The red fir is chiefly composed of standards, much of it running above 3 feet basal diameter and having clear trunks 60 to 90 feet in length. There are mixed with the red-fir type, and sometimes with the alpine-hemlock type as well, scattered trees and small aggregations of sugar and white pine, the individuals averaging 2 to 6 feet in diameter at the base and 40 to 90 feet in length in the clear trunk.

The region around Abbots Butte is noteworthy because it is the most southerly station known in the Cascades for the Alaskan cedar. The species occurs in a few localities on the slopes of and adjoining the butte as scattered individuals in the mass of alpine-hemlock forest, occasionally forming aggregations with 300 to 400 individuals in a close growth. The species is a small tree or large shrub as it grows here, and is of no commercial value whatever.

The forest is fire marked throughout the township and 15 per cent of the standing mill timber has been consumed or killed. It is worthy of note that although the forest on the northern slopes of the Umpqua-Rogue River divide in this and the preceding township has been overrun by fire almost everywhere, the actual quantity of timber consumed is not nearly as large as might be expected considering the extent of the fires. It is doubtless due to the generally wet condition of the humus and litter that more has not been destroyed. The fires have been more severe and widespread along the summit of the divide, where the sheep pastures are found, than elsewhere. As fires in these localities decidedly encourage grass growth at the expense of the forest, there probably is some connection between the sheep camps and the fires that have ravaged the timber in their neighborhood.

The burned-over areas in the township do not reforest rapidly or well. The tendency is toward grassy glades rather than to forest at all the higher elevations, and to dense brush growths at the lower and middle altitudes. Some of the slopes covered with pumice, or with small lapilli, are being denuded of their soil down to the lava bed rock as a result of the fires and the consequent loosening of the forest floor.

The portion of the township south of the Umpqua-Rogue River divide, about one-third of its entire area, can be logged from the Rogue River Valley, although with some difficulty. The balance of the township is inaccessible for logging operations.

Forested and other areas in T. 30 S., R. 2 E., Oregon.

	Acres.
Forested area	21,040
Nonforested area (burned)	2,000
Logged area	None.
Badly burned area	3,500

Total stand of timber in T. 30 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	11.2	20,000,000	25,654,400
Sugar pine.....	5.6	10,000,000	16,896,000
White pine .....	.9	2,000,000	3,379,200
Red fir	61.2	110,000,000	209,889,600
White fir			3,379,200
Noble fir	10	18,000,000	41,550,400
Incense cedar			1,689,600
Alpine hemlock.....	11.1	20,000,000	33,792,000
Western hemlock			1,689,600
Total		180,000,000	337,920,000

Composition of forest in T. 30 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	10
Sugar pine.....	3
White pine.....	Inconsiderable.
Incense cedar.....	Inconsiderable.
Western hemlock.....	Inconsiderable.
Alpine hemlock.....	13
Red fir	60
White fir	2
Noble fir.....	10
Alpine fir.....	Inconsiderable.
Pacific yew.....	Inconsiderable.
Yellow cedar.....	Inconsiderable.

TOWNSHIP 30 SOUTH, RANGE 3 EAST.

The western sections of this township are situated on the southern slopes of the Umpqua-Rogue River divide. The eastern areas comprise in part the valley bottoms of the North Fork of Rogue River and in part low broad spurs projecting westward from the main range of the Cascades, which form a sort of plateau region.

The ridges extending from the Umpqua divide in the western portion of the township are steep and rocky and inclose broad terraced creek bottoms at frequent intervals. The valley of the North Fork of Rogue River is a depression about 2 miles wide and 600 to 800 feet in depth. The valley, so far as it lies in this township, has been scooped out through an immense deposit of pumice and exhibits from 4 to 6 distinct terraces. The terraces on the eastern side of the stream are generally wider than those on the west. In the southern portions of the township the stream has in some places cut through the pumice deposit to the underlying lava bed rock, causing narrows and rapids to form in the channel, which elsewhere is broad and smooth.

The streams originating in the township are of small volume. They are chiefly springs which break out along the slopes of the different terraces west of the river. The springs represent a portion of the seepage coming from the slopes of the Umpqua-Rogue River divide. Although these springs discharge but a trifling amount of water, they have nevertheless succeeded in excavating deep channels through the pumice terraces between the points of issue and their entrance into the river. Some of these channels are 200 feet in depth. In time the entire pumice deposit on the west side of the river will be transported into the bed of the stream through the agency of these springs and the rivulets originating from them.

There are no agricultural lands in the township. Mineral-bearing areas are known to occur in the ridges of the Umpqua-Rogue River divide.

The grazing areas consist of marshy flats and fire glades bordering Rogue River. They occur in the south-central areas of the township and cover in the aggregate 500 or 600 acres.

The forest consists of three types. The yellow-pine type is not well developed, and exists chiefly as scattered groups among the red-fir stands and on the lower ridges in the southwest corner of the township. Most of the heavy forest is on the terraces in the bottoms of the North Fork. It is chiefly stands of red-fir type containing an unusually large percentage of noble fir. Most of the mill timber consists of standards and veterans averaging from 2 to 4 feet in diameter with clear trunks 45 to 75 feet in length. The alpine-hemlock type occurs in the extreme eastern areas. It is of small dimensions throughout.

The mountainous sections of the western tracts of the township are inaccessible for logging operations. The valley portions can easily be logged, but owing to obstructions in the river bed by ancient lava flows, which come to the surface near the junction with Union Creek, the North Fork can not be used for driving. Above the obstructions the channel is free, broad, and 5 to 6 feet in depth during three or four months of the year.

With the exception of isolated patches of forest along the lower valley terraces, the timber is fire marked throughout the entire township. The damage has been immense. Sixty per cent of the standing mill timber has been consumed, or has been so badly damaged within the past forty-five years that it is unfit for commercial purposes. This involves a loss of 250 million feet B. M. in this one township. Much of the burned-over tracts has reforested with lodgepole pine, which in its turn has been burned of late years to the extent of 25 per cent. As a rule, reforestations are abundant on the valley lands, but are composed of the worthless lodgepole pine. On the slopes and highest terraces it is deficient, immensely dense brush growth of the vellum-leaved ceanothus almost invariably replacing the forest in such localities.

Timbered and other areas in T. 30 S., R. 3 E.

	Acres.
Forested area	19,680
Nonforested area (bare rocks and glades, 1,500; burned area, 1,860)	3,360
Badly burned area	6,000
Logged area.....	None.

Total stand of timber in T. 30 S., R. 3 E.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	5.3	8,000,000	9,348,000
Sugar pine.....	6.6	10,000,000	11,686,000
White pine	2	3,000,000	4,674,000
Red fir	73.4	110,000,000	140,232,000
White fir	3.4	5,000,000	23,372,000
Noble fir	8	12,000,000	35,058,000
Incense cedar.....			700,000
Western hemlock			1,168,600
Alpine hemlock.....	1.3	2,000,000	7,012,000
Engelmann spruce			469,400
Total.....		150,000,000	233,720,000

Composition of forest in T. 30 S., R. 3 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	5
Sugar pine.....	5
White pine.....	1
Lodgepole pine.....	10
Red fir.....	45
White fir.....	15
Noble fir.....	10
Incense cedar.....	.1
Western hemlock.....	2
Alpine hemlock.....	5
Engelmann spruce.....	.1

TOWNSHIP 30 SOUTH, RANGE 4 EAST.

The northern and central portions consist of flats and terraces stretching westward from the main range of the Cascades. They are intersected by lava ridges of low relief and furrowed by canyons 300 to 400 feet in depth cut through the pumice deposit, which deeply covers the entire township. The southern sections comprise a flat tract 2 miles in width stretching across the township from east to west.

The township has scarcely any run-off. The streams that flow through it all have their heads in adjoining townships. These streams carry large volumes of water and empty into the North Fork of Rogue River, which cuts the extreme northwest corner of the township.

There are no grazing, agricultural, or mineral-bearing areas.

The forest consists of stands of yellow-pine, red-fir, and alpine-hemlock types. The yellow pine is of poor quality and occurs as small, scattered groups in the western areas of the township. The red fir is composed largely of standards and veterans, generally of the same class and dimensions as those in the preceding township. Much of the alpine-hemlock type is of small dimensions, being reforestations after fires which burned 90 to 100 years ago. The heaviest stands of forest occur in the northwest sections of the township, on terraces belonging to the valley of the North Fork of Rogue River.

The township is easy of access for logging operations. The streams, however, lie in too deep and narrow canyons and are too much obstructed by rocks to be utilized for driving purposes.

Practically all of the forest is fire marked. One-sixth of the entire area has been burned clean of timber, save for an occasional tree, and the remainder has lost 40 per cent of its mill timber through the same cause. The southern areas have suffered the most, but no tract has been entirely exempt. Brush growths of the vellum-leaved ceanothus follow the fires. In a few localities lodgepole-pine reforestations are beginning to supplant the brush.

Timbered and other areas in T. 30 S., R. 4 E., Oregon.

	Acres.
Forested area	19,740
Nonforested area (burned)	3,300
Badly burned area	3,300
Logged area	None.

Total stand of timber in T. 30 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	2	2,000,000	4,309,200
Sugar pine .....	.9	1,000,000	1,077,300
White pine	1	1,000,000	1,077,300
Red fir	78.5	80,000,000	150,822,000
White fir	4.9	5,000,000	30,164,400
Noble fir	9.8	10,000,000	21,546,000
Alpine hemlock	2.9	3,000,000	6,463,800
Total		102,000,000	215,460,000

Composition of forest in T. 30 S., R. 4 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

Yellow pine	3
Sugar pine .....	.1
White pine .....	.1
Lodgepole pine	25
Red fir	60
White fir	5
Noble fir	4.8
Alpine hemlock	2

TOWNSHIP 30 SOUTH, RANGE 5 EAST.

This township is situated on the western slope of the Cascades. The crest of the range occupies the eastern areas. It consists of the rocky western rim of Crater Lake, which attains elevations of 8,600 feet above sea level. The crest is narrow, seldom more than 8 to 10 rods in width. On the east it breaks off by precipices 1,200 to 2,000 feet in height to the depression holding Crater Lake. On the west the crest sinks, through a series of steep escarpments, none of great height, to a terraced region, mostly of low relief, which occupies the central and western sections of the township. The entire region, except the peaks and prominent rocky elevations and escarpments along the crest of the range, is deeply buried under a mass of fine pumice.

A large quantity of water flows out of the township. It originates at the base of the crest of the range in a series of springs and marshy

tracts. The stream channels in their course westward through the township deepen rapidly and soon form canyons 200 to 300 feet in depth.

There are no agricultural lands in the township. Some of the volcanic scoria, lapilli, and pumice in the western sections of the township are said to have yielded colors of gold; otherwise there are no mineral lands.

The grazing lands consist wholly of fire glades. For many years the areas below the crest were periodically burned by sheep herders, hunters, and campers. As the region is mostly above the line of heavy brush growths, grass and sedge came in and covered the burned-over tracts with a more or less thick sward. Neither cattle nor sheep are pastured in this township at the present time.

Stands of red-fir and alpine-hemlock type form the forest. The red-fir type is the principal growth in the western areas. It is mixed with small percentages of yellow and sugar pine. The central and eastern areas are covered with stands of pure alpine-hemlock type, in which the alpine hemlock occurs as the principal component. The forest along the crest is thin. Much of it exists as small groups separated by bare pumice flats or as scattered trees, in which case such areas might perhaps be more properly classed as wooded than as forested. Elevations above 7,500 feet along the crest are rocky and nearly devoid of arborescent growth, stunted individuals of the white-bark pine being almost the only denizens of such tracts.

The mill timber is of poor quality except in the western areas, where the red fir forms the principal species in the stands. It can be logged with little difficulty except such as is naturally encountered in a region of high elevation, heavy snowfalls, and severe winters. It is accessible either from the valley of the North Fork of Rogue River or from the Klamath-Crater Lake wagon road, in the southeastern sections of the township.

Most of the township is marked by fire. The stands of alpine hemlock which occur on the crest have been burned only here and there, owing to the surrounding nonforested pumice flats which have acted as fire breaks. Below the crest the forest has been extensively burned. The largest burns of modern date run back 35 or 40 years, but for the last 100 years the forest on the terraces west of Crater Lake has been periodically burned. This is proved by the age of the lodgepole-pine stands. Reforestations of lodgepole pine follow fires at these elevations, and in the present stands of this species groups of all ages up to 100 or 110 years are represented, while decaying remains of the stands burned 35 or 40 years ago show trees of still higher age. In the last three or four years the region has enjoyed comparative immunity from this scourge and the glades are fast reforesting except in a few of the marshy tracts too wet for forest growth.

Forested and other areas in T. 30 S., R. 5 E., Oregon.

	Acres.
Forested area	12,860
Nonforested area (rocks and lake, 6,000; burned area, 4,180)	10,180
Badly burned area	6,500
Logged area	None.

Total stand of timber in T. 30 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fct B. M.	Fct B. M.
Yellow pine	11.1	1,000,000	1,300,000
Sugar pine	7.8	700,000	700,000
Red fir	44.4	4,000,000	5,000,000
Noble fir	11.1	1,000,000	4,000,000
Alpine hemlock	25.5	2,300,000	14,040,000
Total		9,000,000	25,040,000

Composition of forest in T. 30 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine .....	.01
Sugar pine .....	.01
White pine .....	.001
White-bark pine .....	.0001
Lodgepole pine	14
Red fir	8
White fir .....	.5
Noble fir	11.5
Alpine hemlock	65
Engelmann spruce .....	.0001

TOWNSHIP 30 SOUTH, RANGE 6 EAST.

Most of this township is occupied by the well-known Crater Lake, being situated on the summit of the Cascades. The waters originating along the eastern and southern rim of the lake flow into the Klamath drainage, while that which rises in the west and north goes into Rogue River. The region is rocky and precipitous, with a mean elevation of nearly 7,000 feet, exclusive of the depression holding the lake. With the exception of a few insignificant springs in the southern areas, there is no visible run-off from the township.

There are no agricultural, grazing, or mineral lands.

The forest is entirely of the alpine-hemlock type. Half of the area is merely wooded, scattered trees or groups of trees separated by pumice flats and rocky combs forming the arborescent growth.

The mill timber is mostly confined to the northern areas of the township and is inferior in quality. A few scattered groves of alpine hemlock occur on the southern tracts. Some of the alpine hemlocks in these stands are of large size, occasional individuals reaching 6 to 7 feet in diameter.

There are fire marks on most of the forest in the southern part of the township. Elsewhere the stands of timber are so thin and scattered that fires have never succeeded in obtaining any sort of a start.

Forested and other areas in T. 30 S., R. 6 E., Oregon.

Forested area	Acres. 5,080
Nonforested area (rocks and lake)	17,960
Badly burned area.....	2,500
Crater Lake.....	12,800
Logged area	None.

Total stand of timber in T. 30 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Noble fir.....	33.3	1,000,000	3,000,000
Alpine hemlock.....	66.7	2,000,000	10,000,000
Engelmann spruce			440,000
Total.....		3,000,000	13,440,000

Composition of forest in T. 30 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

Lodgepole pine.....	Per cent. 2
White pine .....	.0001
White-bark pine.....	2
Noble fir.....	.5
Alpine fir.....	.1
Alpine hemlock	95
Engelmann spruce.....	.001

TOWNSHIP 30 SOUTH, RANGE 6½ EAST.

This township is situated on the eastern slopes of the Cascades. The western sections consist of broken, rocky tracks with a mean elevation of 7,000 feet, and contain in the southern areas Mount Scott, an extinct volcanic cone, with an elevation of 9,100 feet. The central and eastern portions comprise a mass of steep, broken ridges and spurs sloping sharply to the levels bordering Klamath Marsh at the foot of the range. The region is volcanic throughout, as is the case with the preceding townships.

A small strip of undetermined width along the eastern edge of the township lies outside the reserve boundaries. If the western boundary of the Klamath Indian Reservation, which here nearly adjoins the forest reserve, should be found to pass along the true east line of the township, the tract now excluded ought to be annexed to the reserve.

With the exception of a few small springs, the region has no visible drainage system.

There are no agricultural, grazing, or mineral lands in the township.

The forest at the lower elevations consists of yellow pine. The stand is of good quality and easy of access from all directions, except from the west.

At the upper edge of the yellow-pine forest along the 5,800-foot contour line begins the alpine-hemlock type. The stands of the type at their lower range are composed of lodgepole pine; at middle altitudes alpine hemlock and noble fir form the forest; while at the highest elevations the tracts are merely wooded with sparse, scattered growth of white-bark pine, alpine fir, and alpine hemlock. Mount Scott projects 600 or 700 feet above timber line.

A great deal of the forest shows fire marks. The entire body of yellow-pine growth has been scared repeatedly. Large fires burned there the past summer. The lodgepole-pine stands at middle elevations are the result of fires which burned before the advent of the white man. Reforestations are nearly always lodgepole pine at all elevations. Brush growths are not common.

Forested and other areas in T. 30 S., R. 6½ E., Oregon.

	Acres.
Forested area	21,010
Nonforested area (bare rocks).....	2,000
Badly burned area	5,000
Logged area.....	None.

Total stand of timber in T. 30 S., R. 6½ E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	72	18,000,000	52,000,000
Noble fir	12	3,000,000	5,600,000
Alpine hemlock.....	16	4,000,000	7,000,000
White fir.....			3,000,000
Total.....		25,000,000	67,600,000

Composition of forest in T. 30 S., R. 6½ E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	60
White pine	Scattered.
White-bark pine	1
Lodgepole pine.....	15
White fir	1
Noble fir.....	5
Alpine fir	Scattered.
Alpine hemlock	17.8

TOWNSHIP 30 SOUTH, RANGE 7 EAST.

This township is situated east of the main range of the Cascades and consists of level tracts deeply covered with pumice deposits and of small areas of slope in the western portions which are also pumice covered.

The forest on the level areas is composed of solid lodgepole-pine stands, reforestations after ancient fires; the slopes bear stands of yellow pine with small groups of lodgepole pine and scattered trees of white fir. Fires of recent times have run through the lodgepole-pine stands, and in a lesser degree through the yellow-pine growths. Tendency of fires in the lodgepole pine is to produce scantily grassed, non-forested tracts; in the yellow-pine to favor growths of lodgepole pine.

Mill timber is moderately easy of access, of medium quality, and largely composed of standards and veterans owing to suppression of young growth by the numerous fires.

Forested and other areas in T. 30 S., R. 7 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area	4,500
Covered with solid stands of noncommercial timber	18,560
Logged area.....	None.

Total stand of timber in T. 30 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	25,000,000	33,600,000

Composition of forest in T. 30 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	12
Lodgepole pine.....	88
White fir.....	Occasional trees.

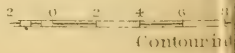


PART OF SOUTHERN OREGON SHOWING DISTRICT

Prepared under the direction of H. H. Henshaw
BY JOHN W. COOPER



Yellow pine



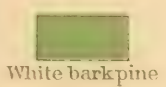
Contour interval 100 feet



JULIUS BIEN & CO LITH NY

DISTRIBUTION OF YELLOW PINE AND WHITE BARK PINE

by Gannett, Geographer in charge
LEIBERG



White bark pine

TOWNSHIP 30 SOUTH, RANGE 8 EAST.

This township is situated east of the Cascades, the extreme eastern areas being covered by portions of Klamath Marsh, the western tracts consisting of a nearly level pumice-covered plain.

The forest is almost wholly a lodgepole-pine growth, reforestation after ancient fires, except along the edge of the marsh where the lodgepole-pine stands mark the receding line of the wet and swampy ground and constitute the primary forest growth on the emerging land.

Recent fires have marked the lodgepole-pine growths here and there, and in such places there is a decided tendency toward grassy tracts rather than reforestations.

The small quantity of mill timber is scattered through the lodgepole pine. It is of very poor quality, being chiefly remnants of an old forest long since burned.

Forested and other areas in T. 30 S., R. 8 E., Oregon.

	Acres
Forested area	17,280
Nonforested area (Klamath Marsh).....	5,760
Logged area.....	None.

Total stand of timber in T. 30 S., R. 8 E., Oregon.

Species.	Local practice.	Michigan practice.
Yellow pine		<i>Fect B. M.</i> 2,240,000

Composition of forest in T. 30 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	0.0001
Lodgepole pine.....	99.9999

TOWNSHIP 30 SOUTH, RANGE 9 EAST.

This township is situated east of the Cascades and consists chiefly of tule- and sedge-covered areas belonging to Klamath Marsh. The extreme eastern areas are formed by a projecting spur of lava and bear the forest. Soil is uniformly a pumice deposit.

All of the timber in the township is fire marked. Result of fires is the suppression of young growth, fire scarring of the older, with twisting and bending of the smaller trunks. There is little brush growth throughout. There is no humus, the forest floor being bare, sharp, pumice sand.

Mill timber is easy of access, but poor in quality, and mostly of small dimensions.

Forested and other areas in T. 30 S., R. 9 E., Oregon.

	Acres.
Forested area	6,400
Nonforested area (Klamath Marsh)	16,640
Logged area	None.

Total stand of timber in T. 30 S., R. 9 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	100	13,000,000	26,240,000

Composition of forest in T. 30 S., R. 9 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	99.5
Lodgepole pine .....	.5

TOWNSHIP 30 SOUTH, RANGE 10 EAST.

This township is situated east of the Cascades. Its northern portion consists of grassy, nonforested bottom lands bordering the Williamson River, while the southern areas are formed of low lava hills, as a rule deeply covered by a fine pumice deposit.

The forest in the township is fire marked throughout. In late years there has been fewer fires than formerly and the young growth, formerly mostly suppressed, is asserting itself everywhere. The young growth is yellow pine with a few scattered individuals of white fir. The lodgepole pine is found along the swales of the Williamson River bottoms.

Mill timber is very good in quality, being largely composed of standards and veterans with fair, clear trunks. It is easy of access from the Williamson River bottoms and forms, as a whole, a valuable stand of timber.

Forested and other areas in T. 30 S., R. 10 E., Oregon.

	Acres.
Forested area	11,800
Nonforested area (marsh and meadows)	11,240
Logged area	None.

Total stand of timber in T. 30 S., R. 10 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect. B. M.</i>
Yellow pine	100	100,700,000	122,700,000

Composition of forest in T. 30 S., R. 10 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	99.5
Lodgepole pine.....	|
White fir.....	.5

TOWNSHIP 30 SOUTH, RANGE 11 EAST.

This township, situated east of the Cascades, consists in the western areas of nonforested bottom lands bordering the Williamson River, and in the eastern portions of pumice-covered lava slopes which form, in part, the western declivities of the Yamsay Range.

The lower and intermediate slopes carry good stands of yellow pine bordered along the marshy areas of the Williamson bottoms by narrow fringes of lodgepole pine. The upper slopes of the range bear chiefly lodgepole pine and white fir. Fires have marked the forest everywhere throughout the township.

The mill timber is easy of access and is of good, clear body, largely composed of standards and veterans.

Forested and other lands in T. 30 S., R. 11 E., Oregon.

Forested area.....	15,340
Nonforested area (glades and meadows).....	7,700
Logged area.....	None.

Total stand of timber in T. 30 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fect B. M.	Fect B. M.
Yellow pine.....	100	80,000,000	93,700,000
White fir.....			3,740,000
Total.....		80,000,000	97,440,000

Composition of forest in T. 30 S., R. 11 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

Yellow pine.....	70
Lodgepole pine.....	20
White fir.....	10

TOWNSHIP 30 SOUTH, RANGE 12 EAST.

This township forms the eastern slopes of the Yamsay Range, an ancient volcanic center. The areas are rocky and broken, and along the upper slope the forest has largely been burned and replaced by brush growths. This township was not examined personally, but was estimated from information.

Forested and other areas in T. 30 S., R. 12 E., Oregon.

	Acres.
Forested area	11,040
Nonforested area (rocks and glades 5,000, burned 7,000)	12,000
Logged area	None.
Badly burned area	8,000

Total stand of timber in T. 30 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	100	20,000,000	35,000,000

Composition of forest in T. 30 S., R. 12 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	75
Lodgepole pine	25

TOWNSHIP 30 SOUTH, RANGE 13 EAST.

This township was not examined personally, but was estimated from information.

Forested and other areas in T. 30 S., R. 13 E., Oregon.

	Acres.
Forested area	8,040
Nonforested area	15,000
Logged area	None.

Total stand of timber in T. 30 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	100	8,000,000	16,000,000

TOWNSHIP 30 SOUTH, RANGE 14 EAST.

This township was not examined personally, but was estimated from information.

Forested and other areas in T. 30 S., R. 14 E., Oregon.

	Acres.
Forested area	10,040
Nonforested area	13,000
Logged area	None.

Total stand of timber in T. 30 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	109	4, 000, 000	8, 000, 000

TOWNSHIP 31 SOUTH, RANGE 2 WEST.

Area forested and woodedacres.. 23, 000

Total stand of timber in T. 31 S., R. 2 W., Oregon.

	<i>Feet B. M.</i>
Yellow pine.....	50, 000, 000
Red fir	100, 000, 000
Sugar pine	} 18, 160, 000
Incense cedar	
Total	168, 160, 000

TOWNSHIP 31 SOUTH, RANGE 1 WEST.

This township consists of portions of the Umpqua-Rogue River divide. It is filled with a mass of north-south spurs, projecting from this divide as a backbone, and is in consequence a steep and, on the whole, inaccessible region for lumbering operations.

The forest is fire marked throughout, having been badly burned along the higher slopes.

Mill timber is mostly confined to the canyon bottoms and the middle elevations. Much of the red fir is of small dimensions and badly fire scarred.

Forested and other areas in T. 31 S., R. 1 W., Oregon.

	<i>Acres.</i>
Forested area	23, 040
Badly burned area	8, 500
Logged area.....	None.

Total stand of timber in T. 31 S., R. 1 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	39.3	75, 000, 000	85, 000, 000
Sugar pine.....	4.2	8, 000, 000	10, 000, 000
Red fir	52.3	100, 000, 000	175, 000, 000
White fir	2.6	5, 000, 000	25, 000, 000
Incense cedar	1.5	3, 000, 000	5, 000, 000
Total		191, 000, 000	300, 000, 000

TOWNSHIP 31 SOUTH, RANGE 1 EAST.

This township is situated on slopes of the Umpqua-Rogue River divide, a ridge separating the drainage basin of Rogue River from that of the South Umpqua River. The divide enters the township in the northeast corner and strikes through it in a direction a trifle south of west. The position of the township is thus partly on the northern, partly on the southern slopes of the divide. The crest of the ridge is a narrow, rocky hogback, 40 to 50 yards wide in some places, in other localities not more than 3 or 4 yards. In its course through the township it varies in altitude from 4,000 to 5,500 feet. It slopes off very sharply, both on the northern and on the southern declivities. The southern slopes, which form the central and southern areas of the township, consist of a large number of narrow, tortuous ridges, inclosing deep canyons. In general all the canyons in these portions of the township head sharply in the steep slopes of the divide, have narrow bottoms 2 to 4 rods wide, and very steep, often rocky sides. The northern declivities of the divide are similar to the southern, but the canyon bottoms are generally wider.

The run-off of the township is large, and flows away in two directions, namely, northward to South Umpqua River, southward to Rogue River by way of Elk Creek.

There are no agricultural lands in the township. The central portions contain a few hundred acres of grazing lands. They consist of open, park-like ridges, covered with yellow pine, where the scattered timber permits a thin growth of grass to exist. Cattle range on these tracts, but no sheep.

The township adjoins known mineral-bearing areas on the east, north, and west. While, so far, no mineral deposits have been discovered here, it is very probable that prospecting will eventually disclose them on both sides of the divide.

All three of the forest types which occur on the nearby slopes of the Cascades are represented in the township. The yellow-pine type is the prevailing forest at low altitudes on the southern and western slopes of the ridges. The red-fir type occupies the canyon bottoms and moist northern and eastern declivities, while the alpine-hemlock type is limited to the summit and highest slopes of the Umpqua-Rogue River divide.

The yellow-pine type is not abundant or well developed. Its stands are thin and scattering, and the component trees, yellow and sugar pine, are only of medium dimensions—20 to 30 inches in basal diameters, 15 to 20 feet clear trunks. Occasionally, however, there occur veteran sugar pines, remnants of a very old growth, whose diameters vary from 6 to 10 feet. These giants are not very common, and almost every one of them is in a state of decay, due to sears and basal burns of modern times. The red-fir type is abundant and well developed. It occurs of three ages—veterans, standards, and young growth. The

veterans are mixed with sugar pine, yellow pine, and white fir, and have dimensions varying from 5 to 9 feet in diameter at the base, with clear trunks 40 to 80 feet in height. The standards occur in extensive bodies throughout the canyon bottoms. The trees average 2 to 3 feet in basal diameters, with clear trunks 40 to 60 feet in length. The young growth represents reforestation after fires which burned the forest one hundred years ago. Stands of this kind are chiefly confined to the northern slopes of the divide, where they appear to have replaced growths of alpine-hemlock type.

The alpine-hemlock type is composed mostly of noble fir and alpine hemlock in almost equal proportions. Previous to fires, originating since the white man's occupancy of the region, the stands of this type were of magnificent proportions. To judge from the remains there were large areas which carried more than 100,000 feet B. M. per acre. The best stands were composed of large veteran trees $2\frac{1}{2}$ to $3\frac{1}{2}$ feet in diameter at the base, with long columnar trunks 50 to 60 feet in the clear. Little remains now but the fire-killed trunks.

Ninety per cent of the forest in the township is fire marked. Forty per cent of the standing timber has been consumed by fire within the past forty-five years, but no area has been burned completely off; there is always some little timber left. Most of the burned-over areas are reforesting, principally with red fir. A few of the southern slopes are becoming brush covered, dense thickets of rhododendron and of vellum-leaved ceanothus occupying the ground.

The southern areas of the township are readily accessible to logging operations by way of the various canyon bottoms. The central portions can be reached only with difficulty, while the summit and higher slopes are practically inaccessible.

Forested and other areas in T. 31 S., R. 1 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area	7,000
Logged area.....	None.

Total stand of timber in T. 31 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	8.8	10,000,000	16,500,000
Sugar pine.....	2.7	3,000,000	3,000,000
Red fir	70.8	80,000,000	160,000,000
Noble fir	7.1	8,000,000	11,000,000
White fir			8,000,000
Incense cedar			620,000
Alpine hemlock.....	10.6	12,000,000	14,000,000
Total.....		113,000,000	213,120,000

Composition of forest in T. 31 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	10
Sugar pine.....	1
White pine.....	.005
Lodgepole pine.....	.5
Incense cedar.....	.005
Oaks, etc.....	1
Red fir.....	60
White fir.....	6
Noble fir.....	10
Alpine fir.....	.0005
Alpine hemlock.....	10

TOWNSHIP 31 SOUTH, RANGE 2 EAST.

This township mostly comprises areas on the southern declivities of the Umpqua-Rogue River divide, a small portion in the northwest corner overlapping on the northern side of the ridge. The entire tract consists of a mass of rough, steep, rocky ridges radiating from the Umpqua-Rogue River divide, and inclosing narrow canyons with precipitous slopes. The southern and portions of the central areas consist of volcanic rocks of the same composition as like formations in the Cascades. The northern sections consist chiefly of porphyries and similar ancient eruptive rocks.

The run-off from the township is of small volume. That from the central and western areas reaches Rogue River by way of Elk Creek, while that which originates in the eastern sections flows into North Fork of Rogue River through a number of small creeks.

There are no agricultural lands in the township. The grazing lands consist of small marshy glades at the heads of various streams. Few of the glades are really open or meadow-like; most of them carrying scattered groups of trees. Cattle range throughout the township, subsisting on browse and on the trifling amount of grass the glades are capable of supplying. There are no sheep regularly pastured, but occasionally bands are driven across the township to grazing grounds in the adjoining township on the north, T. 30 S., R. 2 E.

The northwestern portion of the township is mineral bearing, and a number of claims, said to be of promising appearance, have there been lately opened.

The forest consists of stands belonging to the yellow-pine, red-fir, and alpine-hemlock types. The latter type inhabits the region in the northern portion of the township along the summit and upper slopes of the Umpqua-Rogue River divide. The yellow-pine and red-fir types occur on the lower slopes and in the bottoms of canyons.

The western and some of the central portions of the township have

been badly burned. No tracts have been swept completely clean, thin stands or scattered trees occurring on all of the fire-marked areas. The eastern sections contain large quantities of good mill timber, red fir in standard dimensions being the prevailing species.

The western and central sections are difficult of access; the eastern can be logged from the Rogue River bottoms on the east.

Forested and other areas in T. 31 S., R. 2 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area	8,500
Logged area.....	None.

Total stand of timber in T. 31 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fct B. M.</i>	<i>Fct B. M.</i>
Yellow pine	9.8	18,000,000	23,467,200
Sugar pine.....	4.9	9,000,000	9,850,000
Red fir	65.5	120,000,000	205,338,000
White fir			6,000,000
Noble fir	5.4	10,000,000	14,000,000
Incense cedar.....	.6	1,000,000	1,684,000
Alpine hemlock.....	13.7	25,000,000	33,000,000
Total		183,000,000	293,339,200

Composition of forest in T. 31 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	10
Sugar pine.....	2
Red fir	65
White fir	3
Noble fir	5
Alpine hemlock.....	15
Incense cedar.....	.01

TOWNSHIP 31 SOUTH, RANGE 3 EAST.

The western sections of this township consist of low, rocky terminations of spurs radiating from the Umpqua-Rogue River divide. The central sections comprise a strip of terraced bottom land 2 miles wide, stretching through the township from north to south, deeply covered with pumice débris, and constituting the valley, in part, of the North Fork of Rogue River. The eastern areas consist of a steep, rocky escarpment falling away to the west from the summit of Huckle-

berry Mountain, a volcanic plateau-like tract in some of its portions and connected with the main range of the Cascades in its southeastern corner.

The run-off from the township is small and is carried by the North Fork of Rogue River. The bed of the stream lies between low banks 4 or 5 yards in height. Its current is rapid, but is interrupted in several localities by dikes of lava, through which the stream has cut narrow rocky channels.

There are small tracts of grazing and hay lands bordering the river, 500 or 600 acres in all; otherwise there are no clear lands in the township. The Rogue River bottoms, now heavily forested, would probably become agricultural in character were the timber cleared off. This would give 4,000 or 4,500 acres of such land to the township.

The forest is made up of all the types in the region. The yellow-pine type occurs in the western portions chiefly, and in detached patches mixed with red-fir type in the Rogue River bottoms, where it exists as reforestations after fires, and in the natural course of events will be supplanted by red fir. The chief stands of the red-fir type occur on the bottom lands. It is a massive forest, composed almost wholly of veterans and standards. Much of it is of large dimensions. The red fir averages 2 to 4 feet in diameter, with clear trunks 50 to 100 feet in height; the sugar pine is about the same size for standards, while veterans are often found that are 7 to 8 feet in diameter, with clear trunks 40 to 60 feet in length. Unfortunately there is not a great deal of this sort of forest, which only occurs on the lowest terraces of the bottom lands. The tract can be logged with the greatest facility, and appears to be held wholly by private owners who long since acquired title to it. The alpine-hemlock type occurs on the slopes leading up to the summit of Huckleberry Mountain. It is of poor quality and practically inaccessible for logging operations.

With the exception of red-fir stands on bottom lands the forest has been marked by fire throughout the township. The slopes of Huckleberry Mountain have especially suffered severely.

Reforestation is scanty everywhere; it is practically lacking on Huckleberry Mountain, where heavy brush growths flourish on all the fire-swept areas.

There are no mineral-bearing areas in the township.

Forested and other areas in T. 31 S., R. 3 E., Oregon.

	Acres.
Forested area.....	10,880
Nonforested area (glades and meadows, 4,000; burned, 8,160)	12,160
Badly burned area.....	15,000
Logged area.....	None.

Total stand of timber in T. 31 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	3.3	5,000,000	8,000,000
Sugar pine	5.2	8,000,000	9,000,000
White pine			1,000,000
Red fir	88.8	135,000,000	150,000,000
White fir	2.6	4,000,000	12,000,000
Noble fir			2,000,000
Western hemlock			480,000
Alpine hemlock			1,200,000
Total		152,000,000	183,680,000

Composition of forest in T. 31 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	6
Sugar pine	2
White pine .....	.1
Lodgepole pine .....	.5
Red fir	75
White fir	12
Noble fir	3
Alpine fir .....	.25
Western hemlock .....	.01
Alpine hemlock .....	.5

TOWNSHIP 31 SOUTH, RANGE 4 EAST.

Most of this township consists of tracts comprised within the lines of Huckleberry Mountain, a volcanic mass rising to a height of 6,000 feet, and connected with the main range of the Cascades by a narrow ridge in the southeastern angle of the township. The summit of Huckleberry forms a sort of plateau broken by a few minor depressions and low combs. On its southern side the mountain slopes gradually into Red Blanket Canyon. On the north it presents a bold and steep front to the Rogue River Valley, while on the east there is a steep descent to the narrow bottom of Union Creek. The region is covered with a blanket of fine pumice, which is not very thick on Huckleberry Mountain, but is of unknown depth in the northern portions of the township at the base of the mountain. The drainage discharged from the township is large in volume and flows out by way of Union Creek into the North Fork of Rogue River.

The township contains no agricultural lands. The grazing areas consist of fire glades on the top of the mountain. There is a thin and sparse growth of grass and sedge everywhere on the burned tracts. In the center of the township the glades originated centuries ago and carry a close, thick sward of grass.

No mineral-bearing lands occur in the township.

Fire has marked all of the forest. Almost one-half of the entire area in the township has had all its forest swept off clean. Some of the burns are very old; many are of quite recent origin. In the latter there is a vast accumulation of litter ready for fresh conflagrations. Reforestation is scanty, in most places entirely absent. The burned tracts are covered with thin growths of grass or overrun with blackberry brambles and huckleberry brush. The burns constitute the famous huckleberry patch of the Klamath Indians. When berries are ripe, Indians and white men, women and children, from within a radius of 100 miles congregate here to pick berries. As reforestations would inevitably spoil the berry patch the incentive to fire setting is great with these people.

Most of the forest is composed of stands belonging to the alpine-hemlock type. The heaviest growth occurs adjacent to and in the canyon of Union Creek. Anterior to the fires set by the white man the larger portion of the mountain contained many heavy stands of noble fir and white pine. The timber that is untouched by fire is of fair quality, but most of it is inaccessible to loggers. In Union Creek Canyon occurs the largest and purest growth of western hemlock to be found in the southern part of the Cascade Range Forest Reserve. The trees are small, however, averaging 18 to 22 inches in diameter at the base, with clear trunks 20 to 30 feet in length. Yellow pine, red fir, and incense cedar occur in small quantities in the northern portion of the township at the base of the mountain.

Forested and other areas in T. 31 S., R. 4 E., Oregon.

	Acres.
Forested area	14, 720
Nonforested area (burned)	8, 320
Burned-out area	8, 320
Logged area	None.

Total stand of timber in T. 31 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine			1, 000, 000
Sugar pine			1, 000, 000
White pine	6. 6	5, 000, 000	6, 000, 000
Red fir			4, 200, 000
Noble fir	79	60, 000, 000	98, 000, 000
Incense cedar			600, 000
Western hemlock	4	3, 000, 000	8, 000, 000
Alpine hemlock	10. 4	8, 000, 000	13, 400, 000
Total		76, 000, 000	132, 200, 000

Composition of forest in T. 31 S., R. 4 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	.01
Sugar pine.....	.01
White pine.....	3
Lodgepole pine.....	15
Incense cedar.....	.001
Red fir.....	.5
White fir.....	2
Noble fir.....	70
Western hemlock.....	5
Alpine hemlock.....	4

TOWNSHIP 31 SOUTH, RANGE 5 EAST.

With the exception of its southeast corner this township is situated on the western slope of the main range of the Cascades. Two-thirds of the area included within its limits consist of tracts nearly level or with very gentle slopes toward the east. In the eastern sections rocky combs and low volcanic cones break up the level surface, while near the southern boundary, Union Peak, surrounded by rough lava masses, rises to a height of 7,881 feet above sea level. The northern portions of the township consist of a low range of lava hills with an east-west direction. Pumice débris, mostly fine, but occasionally in boulder-like masses, covers all of the township excepting the summits of the extinct volcanoes and a number of rocky escarpment too steep to hold the pumice in place.

The visible run-off originating in the township is small and flows into Rogue River by way of Castle Creek. The channel of this stream is sunk in a canyon 300 to 350 feet in depth excavated in the loose pumice.

There are no agricultural or mineral lands in the township. The grazing area embraces the entire tract, exclusive of Union Peak, and consists wholly of areas on which the forest has been burned, there being no natural meadows in the region. The grass growth is sparse and scattered. In former years sheep were pastured everywhere in the township, but during the last two years none have been there.

Exclusive of a few stands of red fir and yellow pine in the north-west corner of the township, the forest is of the alpine-hemlock type. Eighty per cent of the timber has been burned since the white man's occupancy, and the burned-over tracts, which originally carried stands of noble fir and alpine hemlock, have reforested with thin and scattered stands of lodgepole pine or are without forest cover. Most of the present forest consists of this species. Fires within recent years have destroyed considerable quantities of these reforestations. Owing to the altitude of the township, 6,000 feet in the mean, brush growths do not flourish. Hence fires are followed by a thin sward of coarse grass and sedge, which after a lapse of some years becomes covered

with stands of lodgepole pine, the forerunner of the alpine-hemlock type proper, of noble fir and alpine hemlock. Sixty per cent of the area of the township is covered with this transition type of forest. The glades due to recent fires are not reforesting to any great extent, but bear preliminary grass growth or are devoid of vegetation, save for a few scattered weeds and high altitude plants.

The mill timber is of poor quality and is widely scattered, mostly in localities where barren, rocky ground prevented the spread of fires. To the south and east of Union Peak are a few heavy stands of alpine hemlock and noble fir. Most of the township is accessible for logging operations by way of the present Fort Klamath-Rogue River wagon road.

Forested and other areas in T. 31 S., R. 5 E., Oregon.

	Acres.
Forested area	20,480
Nonforested area (bare rocks).....	2,560
Badly burned area.....	4,000
Logged area.....	None.

Total stand of timber in T. 31 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine			200,000
Red fir.....			680,000
Noble fir.....	50	10,000,000	20,000,000
Alpine hemlock.....	50	10,000,000	36,000,000
Total.....		20,000,000	56,880,000

Composition of the forest in T. 31 S., R. 5 E., Oregon, including trees of all species with diameters of 4 inches and upward.

	Per cent.
Yellow pine	Scattered trees in Union Creek Canyon.
Sugar pine.....	Scattered trees in Union Creek Canyon.
White pine.....	Scattered trees in Union Creek Canyon.
Lodgepole pine.....	40
Red fir.....	Scattered trees in Union Creek Canyon.
White fir.....	Scattered trees in Union Creek Canyon.
Noble fir.....	3
Alpine fir.....	Scattered.
Alpine hemlock.....	56

TOWNSHIP 31 SOUTH, RANGE 6 EAST.

This township is situated mostly on the eastern slopes of the Cascades, a hundred acres in the northwest corner extending over on the western slope.

Almost the entire township consists of high, rocky, lava ridges varying in elevation from 6,000 to 7,000 feet, with occasional flats between them and on their summits. Most of the region is pumice covered.

A large volume of water flows out of the township. It is carried by Anna and Sun creeks, which head in large springs near Crater Lake. The streams lie in deep canyons, the one containing Anna Creek being noteworthy on account of its gorge-like character.

The township contains no agricultural lands. There are small tracts of grazing land consisting of fire glades now in process of reforestation. Sheep were pastured in the western sections of the township in former years. There have been none in the last two or three years.

The forest consists of stands of alpine-hemlock type. It is fire marked throughout. Fifty per cent of the timber has been burned by fires originating since the coming of the white man, but long before his advent the region was periodically burned over. Most of the forest consists of reforestations of lodgepole pine, or of small-growth alpine hemlock, white pine, and noble fir, which are gradually supplanting the lodgepole pine. Some of these reforestations are in a fair state of preservation; others have been badly burned in recent years. Much of the area here termed forested contains only scattered trees and might, perhaps, be more appropriately classed as wooded. This is the case with all the areas in the northern sections adjoining Crater Lake, which naturally are barren and rocky and carry only small amounts of arborescent vegetation in thin, widely scattered stands.

The mill timber is of poor quality throughout. Most of it occurs on rough lava ridges situated between the canyons of Anna and Sun creeks in the central portions of the township. The crest of the Cascades, a narrow comb of lava in the western areas, carries a few heavy stands of alpine hemlock and noble fir. The region is inaccessible for logging operations.

Forested and other areas in T. 31 S., R. 6 E., Oregon.

	Acres.
Forested area	21,440
Nonforested area (bare rocks)	1,600
Badly burned area	4,000
Logged area	None.

Total stand of timber in T. 31 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
White pine			5,000,000
White fir			5,000,000
Noble fir	40	10,000,000	15,000,000
Alpine hemlock	60	15,000,000	25,000,000
Engelmann spruce			520,000
Total		25,000,000	50,520,000

Composition of forest in T. 31 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	Occasional trees.
Sugar pine	Occasional trees.
White pine	0.5
White-bark pine	Occasional trees.
Lodgepole pine	30
White fir	3
Noble fir	10
Alpine fir	Occasional trees.
Alpine hemlock	56
Engelmann spruce .....	.001

TOWNSHIP 31 SOUTH, RANGE 6½ EAST.

This township is situated on the eastern slope of the main range of the Cascades, and comprises a mass of rocky spurs and ancient lava flows radiating from Mount Scott and the volcanic vents in the region of Crater Lake as their focus.

The forest on the higher slopes is subalpine in character. Fires have ravaged it in all directions. The burned tracts are either slowly reforesting with lodgepole pine and alpine hemlock or are covered with dense brush growths.

Mill timber is confined to the lower slopes of the ridges radiating from Mount Scott and to the middle elevations on the areas southeast of Crater Lake. The subalpine varieties are of poor quality; the yellow pine on the lowest slopes is fair in character and not especially difficult of access.

Forested and other areas in T. 31 S., R. 6½ E., Oregon.

	Acres.
Forested area	21,040
Nonforested area (bare rocks and glades)	2,000
Badly burned area	6,000
Logged area	None.

Total stand of timber in T. 31 S., R. 6½ E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fect B. M.	Fect B. M.
Yellow pine	77.0	50,000,000	65,000,000
White fir			1,000,000
Noble fir.....	7.7	5,000,000	5,000,000
Alpine hemlock.....	15.3	10,000,000	27,920,000
Total.....		65,000,000	98,920,000

Composition of forest in T. 31 S., R. 6½ E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	55
Sugar pine.....	1
White pine.....	
White-bark pine.....	
Lodgepole pine.....	20
White fir.....	1
Noble fir.....	2
Alpine hemlock.....	20
Engelmann spruce.....	1

TOWNSHIP 31 SOUTH, RANGE 7 EAST.

This township consists of level, pumice-covered areas along the eastern base of the Cascades.

The forest in the central and eastern portions is chiefly a lodgepole growth, reforestations after fires which burned and destroyed the timber thirty or forty years ago. Before these fires the forest was lodgepole also, made so by fires during the exclusive Indian occupancy.

The mill timber is yellow pine, and occurs in the western and southwestern areas, with small stands of it scattered among the lodgepole-pine growth. It is of medium quality, being knotty and fire seared.

Forested and other areas in T. 31 S., R. 7 E., Oregon.

	Acres.
Forested area.....	20,000
Nonforested area (rocks and glades).....	3,040
Logged area.....	None.

Total stand of timber in T. 31 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fect B. M.	Fect B. M.
Yellow pine	100	40,000,000	71,500,000
White fir			500,000
Total.....		40,000,000	72,000,000

Composition of forest in T. 31 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	24
Lodgepole pine	75
White fir	} 1
Incense cedar	

TOWNSHIP 31 SOUTH, RANGE 8 EAST.

This township is situated east of the Cascade Range. The north-western and the southeastern areas consist of low, pumice-covered levels but slightly elevated above Klamath Marsh which carry a forest of lodgepole pine, which marks the lines of comparatively recent recessions of the marsh. The balance of the lands in the township comprise marsh and tule lands, permanently or intermittingly covered with water derived from the Williamson River and from local drainage. The forest is composed entirely of lodgepole pine, with no mill timber at all.

Forested and other areas in T. 31 S., R. 8 E., Oregon.

	Acres.
Forested area	5,640
Nonforested area (Klamath Marsh)	17,400

TOWNSHIP 31 SOUTH, RANGE 9 EAST.

This township is situated east of the Cascades. It comprises in its western areas chiefly permanently water-covered tracts of Klamath Marsh; in its eastern portions low, pumice-covered lava ridges and slopes, which are intersected by or inclose small grassy glades.

The hills and higher levels carry yellow pine, while lodgepole pine fringes the marshy areas and the small glades. Fires have run through all the forest stands in the township, badly searing much of the yellow pine.

The mill timber is easy of access, is of medium quality, but contains a large percentage of dimensions below standards, 45 per cent running below 22 inches basal diameter.

Forested and other areas in T. 31 S., R. 9 E., Oregon.

	Acres.
Forested area	14,740
Nonforested area (marsh and meadow)	8,300
Logged area	None.

Total stand of timber in T. 31 S., R. 9 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	35,000,000	76,160,000

Composition of forest in T. 31 S., R. 9 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	80
Lodgepole pine.....	19
White fir.....	1

TOWNSHIP 31 SOUTH, RANGE 10 EAST.

This township, situated east of the Cascade Range, consists of low, rolling hills, volcanic in their origin, covered with a fine, light, ashy-gray pumice detritus and furrowed by shallow gullies which occasionally widen into small grassy glades or flats covered with lodgepole pine.

Most of the timber is fire marked, but the damage has been light. Fires have not run much in later years and the young growth of yellow pine is therefore abundant.

The mill timber is mostly composed of standards and veterans with exceptionally long, clear trunks. The stand of timber in the township is as a whole a most valuable one. It is readily accessible from the valley of the Williamson River.

Forested and other areas in T. 31 S., R. 10 E., Oregon.

	Acres.
Forested area.....	23,040
Logged area.....	None.

Total stand of timber in T. 31 S., R. 10 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet. B. M.
Yellow pine.....	100	200,000,000	220,800,000

Composition of forest in T. 31 S., R. 10 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	95
Lodgepole pine.....	4
White fir.....	1

TOWNSHIP 31 SOUTH, RANGE 11 EAST.

This township is situated east of the Cascade Range. The lands in this township consist in the eastern areas of lava slopes and ridges radiating from the Yamsay Range; in the western areas partly of dry meadow lands bordering the Williamson River, and in part of low pumice-covered lava slopes bordering the west bank of the Williamson River.

The forest is fire marked throughout; the damage has been light. Lodgepole-pine stands fringe the meadow lands along the Williamson, yellow-pine timber covers the slopes.

The mill timber is of good quality, largely composed of standards, and is readily accessible from the Williamson River bottoms.

Forested and other areas in T. 31 S., R. 11 E., Oregon.

	Acres.
Forested area	19, 140
Nonforested area (meadows and glades)	3,900
Logged area	None.

Total stand of timber in T. 31 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	140, 000, 000	200, 000, 000
White fir			2, 900, 000
Total		140, 000, 000	202, 900, 000

Composition of forest in T. 31 S., R. 11 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	95
Lodgepole pine	4
White fir	1

TOWNSHIP 31 SOUTH, RANGE 12 EAST.

This township is situated on the eastern slopes of the Yamsay Range, a pumice-covered lava region. The area was not examined personally, but was estimated from information.

Forested and other areas in T. 31 S., R. 12 E., Oregon.

	Acres.
Forested area	15, 040
Nonforested area	8, 000
Logged area	None.

Total stand of timber in T. 31 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	17, 000, 000	25, 000, 000

Composition of forest in T. 31 S., R. 12 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	40
Lodgepole pine.....	60

TOWNSHIP 31 SOUTH, RANGE 13 EAST.

This township consists of low hills bordering Sycan Marsh on the west. It was not examined personally, but was estimated from information.

Forested and other areas in T. 31 S., R. 13 E., Oregon.

	Acres.
Forested area.....	11,040
Nonforested area.....	12,000
Logged area.....	None.

Total stand of timber in T. 31 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine.....	100	8,000,000	12,000,000

Composition of forest in T. 31 S., R. 13 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	20
Lodgepole pine.....	80

TOWNSHIP 31 SOUTH, RANGE 14 EAST.

The lands in this township consist chiefly of areas adjoining Sycan Marsh. They were not examined personally, but were estimated from information.

Forested and other areas in T. 31 S., R. 14 E., Oregon.

	Acres.
Forested area.....	11,040
Nonforested area.....	12,000
Logged area.....	None.

Total stand of timber in T. 31 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine.....	100	24,000,000	48,000,000

Composition of forest in T. 31 S., R. 14 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	10
Lodgepole pine.....	90

TOWNSHIP 32 SOUTH, RANGE 2 WEST.

This township is situated on both slopes of the Umpqua-Rogue River divide, which strikes through the township from west to east. It is a very rocky and broken region and difficult of access for lumbering operations. It was examined in part personally and the balance estimated from information.

Forested and other areas in T. 32 S., R. 2 W., Oregon.

	Acres.
Forested area.....	22,440
Nonforested area (naturally nonforested).....	600
Badly burned area.....	3,500
Logged area.....	None.

Total stand of timber in T. 32 S., R. 2 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine.....	7.4	10,000,000	15,000,000
Sugar pine.....	3.7	5,000,000	6,000,000
Red fir.....	86.3	116,500,000	175,000,000
White fir.....	2.2	3,000,000	12,000,000
Incense cedar.....	.4	500,000	1,000,000
Total.....		135,000,000	209,000,000

TOWNSHIP 32 SOUTH, RANGE 1 WEST.

This township consists of a broken and rugged region sloping north and south from the Umpqua-Rogue River divide, which traverses the township in an east-west direction. It is difficult of access for lumbering operations.

The forest is fire-marked throughout. Result of fires is brush growths on the southern slopes; reforestations of red fir on the summits and north slopes of the ridges.

The mill timber is of inferior quality, being largely composed of red fir, tall in growth, but of small diameters. Most of the sugar pine is made up of standards and veterans, badly burned on the lower third of the trunk.

Forested and other areas in T. 32 S., R. 1 W., Oregon.

	Acres.
Forested area	21,840
Nonforested area (burned)	1,200
Badly burned area	5,000
Logged area	None.

Total stand of timber in T. 32 S., R. 1 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fct B. M.</i>	<i>Fct B. M.</i>
Yellow pine	13.9	20,000,000	30,000,000
Sugar pine	4.9	7,000,000	8,000,000
Red fir	75	108,000,000	195,000,000
White fir	5.5	8,000,000	13,000,000
Incense cedar .....	.7	1,000,000	2,000,000
Total		144,000,000	248,000,000

Composition of forest in T. 32 S., R. 1 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	20
Sugar pine .....	.01
Red fir	70
White fir	8
Incense cedar .....	.001
Oaks, etc	1.9

TOWNSHIP 32 SOUTH, RANGE 1 EAST.

This township is situated on the southern slopes of the Umpqua-Rogue River divide, and chiefly forms the upper drainage basin of Elk Creek. It is a very broken region with steep slopes and narrow canyons between the ridges.

The forest is heavy along the upper slopes where fires have spared it, but is of thin and scattering growth on the lower declivities fronting on the Rogue River Valley. The forest is fire-marked throughout and exhibits large areas covered with brush and with but scattered trees as the result.

The mill timber is of inferior quality, being badly fire-seared as regards the red fir, which is generally of small dimensions.

Forested and other areas in T. 32 S., R. 1 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area	8,000
Logged area (culled and cut over for mining purposes)	200

Total stand of timber in T. 32 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	16.6	30,000,000	48,000,000
Sugar pine .....	.5	800,000	800,000
Red fir	81.6	147,000,000	190,000,000
White fir	1.1	2,000,000	8,000,000
Incense cedar .....	.2	200,000	440,000
Total		180,000,000	247,240,000

Composition of forest in T. 32 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	22
Sugar pine .....	.2
Red fir	70
White fir	5
Oaks, etc	2.8

TOWNSHIP 32 SOUTH, RANGE 2 EAST.

This township comprises a mass of high, often rocky, spurs projecting southward from the Umpqua-Rogue River divide.

Fires have run throughout the township, causing large deforested areas now covered with brush growths. The slopes fronting on the Rogue River Valley are mostly rocky, with sparse forest stands of yellow pine and small red fir.

The mill timber is generally of poor quality, and much of it is inaccessible.

Forested and other areas in T. 32 S., R. 2 E., Oregon.

	<i>Acres.</i>
Forested area	18,540
Nonforested area (burned, 2,000; agricultural, etc., 2,500)	4,500
Badly burned area	7,500
Logged area (culled over)	2,000

Total stand of timber in T. 32 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	58.8	40,000,000	54,000,000
Sugar pine	7.3	5,000,000	6,000,000
Red fir	29.4	20,000,000	110,000,000
White fir	3.7	2,500,000	10,000,000
Incense cedar .....	.7	500,000	1,120,000
Total		68,000,000	181,120,000

Composition of forest in T. 32 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	30
Sugar pine.....	1
Red fir.....	60
White fir.....	6
Incense cedar.....	.3
Oaks, etc.....	2.7

TOWNSHIP 32 SOUTH, RANGE 3 EAST.

This township consists of level bottom lands in the Rogue River Valley, with portions of the Mill Creek and Red Blanket bottoms and benches.

The forest is of massive proportions, but its uniformity is broken by numerous patches of young red-fir, yellow-pine, and lodgepole-pine stands, which are reforestations after ancient fires—that is, of fires which burned within the last eighty or one hundred years. Settlements along the Mill Creek bottoms have made inroads in the forest. Modern fires have burned chiefly along Red Blanket Creek.

The mill timber is excellent and easy of access. Much of the red fir and sugar pine run from 5 to 7 feet basal diameters, with clear trunks 70 feet in length.

Reproduction is good; soil is chiefly a pumice sand.

Forested and other areas in T. 32 S., R. 3 E., Oregon.

	Acres.
Forested area.....	17,940
Nonforested area (burned 4,000; meadows and glades, 1,100).....	5,100
Badly burned area.....	3,000
Logged area (culled over).....	2,500

Total stand of timber in T. 32 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine.....	5.7	20,000,000	45,000,000
Sugar pine.....	28.5	100,000,000	100,000,000
White pine.....	1.4	5,000,000	6,000,000
Red fir.....	63	220,000,000	286,000,000
White fir.....	1.4	5,000,000	12,240,000
Western hemlock.....			3,000,000
Total.....		350,000,000	452,240,000

Composition of forest in T. 32 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	9
Sugar pine	22
White pine	1
Lodgepole pine.....	1
Western hemlock .....	.5
Red fir	60
White fir	6
Noble fir	Scattered trees.
Oaks, etc.....	.5

TOWNSHIP 32 NORTH, RANGE 4 EAST.

The position of this township is well over on the western declivities of the Cascades. It comprises rocky and mountainous slopes draining partly into Red Blanket Canyon and partly into the canyon of the Middle Fork of Rogue River. The southern areas are especially rocky and broken, a point named Bessie Rock being the nucleus for a system of deeply sculptured ridges and canyons. In the extreme southern part of the township, where the ridges that center in Bessie Rock break off to the canyon of the Middle Fork, they present a front 2,800 feet in height. The soil everywhere is thin and mostly composed of pumice. Much of it appears to have been washed away as a result of forest fires.

The drainage channels consist of the middle portions of Red Blanket Creek and a 4 or 5 mile section of the Middle Fork of Rogue River. Red Blanket is a small stream and carries a moderate volume of water.

The township contains no grazing or agricultural lands and no known mineral-bearing areas.

The forest belongs wholly to the alpine-hemlock type. Formerly many of the stands of noble fir and alpine hemlock must have been of fine proportions. Within the last forty years fires have laid low most of the timber and damaged that which still stands on root. The fires have been hot and have covered a large area. On the slopes facing the Middle Fork Canyon one may look up and down for miles and not see many trees. On most of the burned-over area there is practically no reforestation. Brush has taken the place of the forest and apparently is in permanent possession.

Most of the mill timber is of small dimensions and is damaged by fire. Much of it consists of noble fir. On the south side of Red Blanket there is now and then a stand where this species averages 30 inches in diameter at the base, with clear trunks 30 to 40 feet in length.

With the exception of limited tracts in the extreme western sections the areas of the township are inaccessible for logging operations.

Forested and other areas in T. 32 S., R. 4 E., Oregon.

	Acres.
Forested area	10,040
Nonforested area (burned).....	13,000
Badly burned area	13,000
Logged area	None.

Total stand of timber in T. 32 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
White pine	5.8	3,000,000	5,000,000
Noble fir.....	88.3	45,000,000	90,000,000
Western hemlock	2.	1,000,000	3,000,000
Alpine hemlock.....	3.9	2,000,000	7,960,000
Total		51,000,000	105,960,000

Composition of forest in T. 32 S., R. 4 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
White pine	2
Red fir.....	Inconsiderable.
Alpine fir	Inconsiderable.
Noble fir.....	88
Western hemlock	3
Alpine hemlock.....	5

TOWNSHIP 32 SOUTH, RANGE 5 EAST.

This township occupies areas on the summit and western slopes of the Cascades with the exception of a few hundred acres in the north-east and southeast angles, which overlap on the eastern side of the range. The summit of the Cascades strikes through the township from north to south along its east line. In the northern and in the southern portions the summit is a broad, pumice-covered level in some places a mile in width with only a few low combs interrupting the flat surface. In the central portions many cross ridges and isolated rocky buttes break up the summit level of the range into an irregular, comparatively narrow crest. Most of the township consists of a basin-like tract hemmed in on the north, east, and south by terraced lava flows which had their origin partly in Union Peak, a volcanic center in the next township north, partly in various vents along the main summit in the central and southwestern areas of the township.

The drainage from the township is small in volume. Most of it is carried by Red Blanket Creek, which has its rise in the eastern sections. An insignificant quantity finds its way into the Middle Fork of

Rogue River. Evidently the larger portion of the annual precipitation which falls on the areas of the township sinks in the loose pumice and fissured lava and is lost to view.

No agricultural lands exist in the township. The grazing areas contain in the aggregate 1,500 acres and consist exclusively of fire glades which are reforesting more or less rapidly. Cattle and sheep were pastured in the township in former years. None have been there in recent years.

The forest is of the alpine-hemlock type throughout. It occurs in stands of many different ages, each group or aggregation occupying small areas surrounded and separated by extensive tracts of burned-over ground. Fires of modern times have destroyed 60 per cent of the forest. Not all of the fire glades and burned-over tracts are due to the white man. Very many date back to the Indian occupancy. The township appears to have been peculiarly exposed to forest fires from as far back as it is possible to trace the history of the present forest. Reforestations consist of lodgepole pine and alpine hemlock, the former species predominating. Owing to the altitude at which the township is situated, 6,000 feet in the mean, brush growths after fires are lacking. If a return to forest cover does not take place, then the ground either remains bare of vegetation or a thin interrupted sward of sedge and grass comes in.

Most of the mill timber is of inferior quality, besides being composed of species of no value from the lumberman's point of view. The altitude of the region averages too great for extensive stands of large timber in this latitude, but occasional stands of alpine hemlock, 200 to 300 years old, exhibit fine proportions. At this elevation the species usually grows in close groups, composed of 10 or 20 individuals collected together on what appears to be a common root. Such close growth develops clear trunks, although not commonly of large diameters. Stands of this character sometimes run as high as 25,000 feet B. M. per acre. Their extent is, however, quite limited.

The areas of the township are inaccessible for logging operations, and no mineral-bearing ground is there known to occur.

Forested and other areas in T. 32 S., R. 5 E., Oregon.

	Acres.
Forested area	11, 440
Badly burned area (nonforested, deforested by fires)	11, 600
Logged area	None.

Total stand of timber in T. 32 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
White pine	3.5	1,300,000	1,900,000
Noble fir	26.8	10,000,000	14,000,000
Western hemlock			600,000
Alpine hemlock	69.7	26,000,000	52,000,000
Engelmann spruce			460,000
Total		37,300,000	68,960,000

Composition of forest in T. 32 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
White pine	1
Noble fir	12
Alpine fir	2
Lodgepole pine	15
Alpine hemlock	68
Other species	2

TOWNSHIP 32 SOUTH, RANGE 6 EAST.

The position of this township is on the eastern slope of the Cascades. The western portion consists of a strip of the summit of the range. It is pumice covered throughout, level in some places, while in others it is made up of lava combs, with one conspicuous truncate volcanic cone locally known as "Goose Nest."

The central portions consist of many lava terraces and low ridges, the whole constituting a long gradual slope to the foot of the range. The eastern sections comprise flat, level tracts but slightly elevated above the marshy tracts at the north end of Upper Klamath Lake, which barely reach beyond the lines of the township in the southeast angle.

With the exception of a few insignificant springs, the township possesses no visible stream within its boundaries. The northeastern portions are intersected by Anna Creek, a stream heading in the township adjoining on the north. Where the stream enters the township its bed is sunk in a canyon 350 to 400 feet in depth, with nearly perpendicular walls, and having a width of about 100 yards at its brink. After emerging from the lava flows and terraces in which the canyon is sunk, the stream flows the balance of the way through the township in a channel with banks 10 to 15 feet in height. Its water is used by settlers in the adjoining township on the east for purposes of irrigation.

The township has a small amount of land which, when cleared and

irrigated, can be used for grazing and agricultural purposes. The total amount is in the neighborhood of 1,000 acres. At present the tract carries an open and scattered growth of yellow and lodgepole pine. There is a thin sward of grass and sedge among the trees, and the land is at present utilized for a cattle range.

No mineral-bearing areas are known to occur.

The forest consists of stands of yellow-pine and alpine-hemlock types. It is fire marked throughout. Most of the old and standard growth of alpine-hemlock type has long since been burned, and reforestation, made up of lodgepole pine, white pine, and alpine hemlock, of small size and in dense, thick stands, have taken the place of the former forest. The stands of yellow-pine type have been grievously thinned by the fires, and dense masses of underbrush, composed almost exclusively of the vellum-leaved ceanothus, have occupied the place of the burned forest.

The only mill timber in the township of any commercial value at the present time is the yellow pine. It is only of medium quality, being defective from fire sears and unusually knotty in the trunk. It is easy of access, as it grows only on the lowest levels. The white fir is generally too knotty and short of trunk to be of any value; besides a large proportion, fully 50 per cent, is defective, owing to rot induced by fire. The logging operations have been confined to culling the sugar pine for the use of settlers in adjoining townships to the east.

The areal and timber estimates for the township are as follows:

Forested and other areas in T. 32 S., R. 6 E., Oregon.

	Acres.
Forested area	20,440
Nonforested area (meadows, glades, and agricultural)	2,600
Badly burned area	5,000
Logged area (culled over)	1,000

Total stand of timber in T. 32 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	76.3	42,000,000	65,000,000
White pine			3,000,000
White fir	18.2	10,000,000	30,000,000
Noble fir			1,480,000
Alpine hemlock	5.4	3,000,000	10,000,000
Total		55,000,000	109,480,000

Composition of forest in T. 32 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	24
Sugar pine	Scattered trees.
White pine .....	.2
Lodgepole pine	30
Engelmann spruce	Scattered trees.
Cottonwoods, etc.	1
Red fir	Scattered trees.
Noble fir	1
White fir	6
Alpine fir .....	.1
Alpine hemlock	37

TOWNSHIP 32 SOUTH, RANGE 7½ EAST.

This township is situated east of the Cascade main range. It consists of low punice-covered lava slopes and ridges in the western areas and of marshy tracts in the central portions, which rise into low lava plateaus or ridges in the eastern sections.

Fires have run everywhere throughout the forest stands in the township, producing lodgepole-pine and brush growths.

The mill timber occurs as a fairly solid body in the eastern sections, and as scattered aggregations intermixed with much lodgepole pine elsewhere. It is of medium quality and easy of access.

Forested and other areas in T. 32 S., R. 7½ E., Oregon.

	Acres.
Forested area	16,640
Nonforested area (marsh, meadow, and agricultural)	6,400
Badly burned area	7,500
Logged area	800

Total stand of timber in T. 32 S., R. 7½ E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	83.3	50,000,000	65,000,000
Sugar pine	8.3	5,000,000	5,000,000
White fir	8.3	5,000,000	15,000,000
Incense cedar			300,000
Total		60,000,000	85,300,000

Composition of forest in T. 32 S., R. 7½ E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent
Yellow pine.....	70
Sugar pine.....	1
White pine.....	Scattered trees along Anna Creek.
Lodgepole pine.....	15
Red fir.....	Scattered trees along Anna Creek.
White fir.....	13.5
Incense cedar.....	} .5
Cottonwoods.....	

TOWNSHIP 32 SOUTH, RANGE 7 EAST.

This township is situated east of the Cascade Range, and consists of a rolling plateau, pumice covered, furrowed by shallow ravines, and ridged here and there by low spurs extending from the Cascades.

The forest is fire marked throughout. Result of the fires is suppression of undergrowth and seedling and sapling growth, with formation of lodgepole-pine stands along the slopes and in the bottoms of the ravines.

The mill timber is chiefly yellow pine. Except for the fire marks the pine is fair in appearance, but the timber when sawed is found to be knotty with twisted grain. This is a common defect inherent in all yellow pine east of the Cascades in this region, and is due to the very open growth caused by the frequently repeated fires of the past and present times.

Forested and other areas in T. 32 S., R. 7 E., Oregon.

	Acres.
Forested area.....	20,540
Nonforested area (meadows and glades, 1,000; burned, 1,000).....	2,000
Badly burned area.....	1,000
Logged area.....	None.

Total stand of timber in T. 32 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine.....	94.6	140,000,000	160,480,000
Sugar pine.....	5.4	8,000,000	9,440,000
White fir.....			18,880,000
Total.....		148,000,000	188,800,000

Composition of forest in T. 32 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	64
Sugar pine.....	5
Lodgepole pine.....	.5
White fir.....	30
Deciduous species.....	.5

TOWNSHIP 32 SOUTH, RANGE 8 EAST.

This township is situated east of the Cascade Range. It comprises marsh lands, nonforested, wet and swampy areas, and broad flats in the northern and central areas; volcanic buttes and slopes covered with pumice in the southern sections.

The low lands carry stands of almost pure lodgepole-pine growths; the areas at higher levels carry stands of yellow pine. The yellow-pine forest is fire marked throughout with resultant suppression of underbrush and young forest growth, and extensive fire searing of the larger trees. The lodgepole pine is here not the result of fires, but is the primary coniferous growth on land too wet to bear any other.

The mill timber is of poor quality and occurs on the hills and slopes in the southern sections. It is easy of access from Klamath Marsh.

Forested and other areas in T. 32 S., R. 8 E., Oregon.

	Acres.
Forested area.....	18,240
Nonforested area (marsh and meadow).....	4,800
Logged area.....	None.

Total stand of timber in T. 32 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine.....	100	22,000,000	34,560,000

Composition of forest in T. 32 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	15
Lodgepole pine.....	85

TOWNSHIP 32 SOUTH, RANGE 9 EAST.

This township is situated east of the Cascades and comprises in the western and central areas wet or swampy lands, in some places permanently covered with water, in others intermittently wet and dry. It carries stands of small-growth lodgepole pine or, where too wet, produces marsh grass, sedge, rush or tule.

The eastern areas consist of low, pumice-covered hills and slopes, volcanic in their origin, carrying moderately heavy stands of yellow pine of medium quality, short bodied and with diameters, for the mill timber, of from 20 to 30 inches; 25 per cent of the stand is worthless in the lower 6 feet of trunk owing to fire scars.

The mill timber is easy of access.

Forested and other areas in T. 32 S., R. 9 E., Oregon.

	Acres
Forested area	14,000
Nonforested area (marsh and meadow)	9,040
Logged area	None.

Total stand of timber in T. 32 S., R. 9 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	50,000,000	98,000,000

Composition of forest in T. 32 S., R. 9 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	40
Lodgepole pine	60

TOWNSHIP 32 SOUTH, RANGE 10 EAST.

This township is situated east of the Cascade Range, and consists of low, pumice-covered hills of volcanic origin, lying between Klamath Marsh and Williamson River.

The forest is fire marked throughout. The eastern areas contain areas of grassy swales, branching out from the Williamson River bottoms, thinly covered with scattered stands of lodgepole pine. The higher levels carry good stands of a fair quality of yellow pine, easy of access.

Forested and other areas in T. 32 S., R. 10 E., Oregon.

	Acres.
Forested area	23,040
Nonforested area (thin stands of lodgepole pine)	3,000
Logged area	None.

Total stand of timber in T. 32 S., R. 10 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	120,000,000	154,800,000

Composition of forest in T. 32 S., R. 10 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	90
Lodgepole pine.....	10

TOWNSHIP 32 SOUTH, RANGE 11 EAST.

This township is situated east of the Cascades, and comprises in the western and southern areas flat, pumice-covered bottom lands bordering the Williamson River, nonforested, and producing large quantities of forage. The eastern portions of the township are formed of rolling, pumice-covered lava hills, radiating from the Yamsay Range, and bear stands of yellow pine, easy of access, of medium quality, much cut up, and intersected by stands of lodgepole pine, which are reforestations after fires. These lodgepole growths have been badly burned in recent years. The yellow pine is fire marked throughout.

Forested and other areas in T. 32 S., R. 11 E., Oregon.

	Acres.
Forested area.....	15,340
Nonforested area (burned, 2,000; marsh and meadow, 5,700).....	7,700
Badly burned area.....	4,000
Logged area.....	None.

Total stand of timber in T. 32 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine.....	100	70,000,000	88,000,000

Composition of forest in T. 32 S., R. 11 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	75
Lodgepole pine.....	25

TOWNSHIP 32 SOUTH, RANGE 12 EAST.

The lands in this township comprise low, rolling, pumice-covered slopes situated on the eastern declivities of the Yamsay Range.

The mill timber is exclusively yellow pine, fire marked throughout, easy of access from the Sycan, hence from the Sprague River Valley; of medium quality, much intersected by lodgepole-pine reforestations after fires; the lodgepole stands extensively invaded by recent fires which have utterly destroyed them in many places, giving rise to fire glades chiefly covered with brush.

Forested and other areas in T. 32 S., R. 12 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area	5,000
Logged area	None.

Total stand of timber in T. 32 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	175,000,000	197,800,000

Composition of forest in T. 32 S., R. 12 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	85
Lodgepole pine	14.5
White fir, etc	Scattered trees.

TOWNSHIP 32 SOUTH, RANGE 13 EAST.

This township consists of low, pumice-covered lava slopes in its western areas belonging to the Yamsay Range. The central portions comprise flat or gently rolling, pumice-covered levels, while the eastern sections consist of marshy tracts belonging to Sycan Marsh.

The higher levels of the Yamsay Range carry stands of yellow pine of medium quality; the intermediate levels bear lodgepole-pine growths which are mostly reforestations after ancient fires, but are extensively invaded by fires of modern origin.

Forested and other areas in T. 32 S., R. 13 E., Oregon.

	Acres.
Forested area	14,040
Nonforested area (marsh)	9,000
Badly burned area	2,600
Logged area	None.

Total stand of timber in T. 32 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	75,000,000	91,500,000

Composition of forest in T. 32 S., R. 13 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	35
Lodgepole pine	65

TOWNSHIP 32 SOUTH, RANGE 14 EAST.

This township comprises chiefly marsh lands belonging to the Sycam, and is situate east of the Yamsay Range. It was not personally examined, but was estimated from information.

Forested and other areas in T. 32 S., R. 14 E., Oregon.

	Acres.
Forested area.....	13,040
Nonforested area (marsh).....	10,000
Logged area.....	None.

Total stand of timber in T. 32 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	18,000,000	32,000,000

Composition of the forest in T. 32 S., R. 14 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	10
Lodgepole pine.....	90

TOWNSHIP 33 SOUTH, RANGE 2 WEST.

This township was not examined personally, but was estimated from information.

Forested and other areas in T. 33 S., R. 2 W., Oregon.

	Acres.
Forested area.....	22,040
Nonforested area	1,000
Logged area (culled)	3,000
Badly burned area.....	6,000

Total stand of timber in T. 33 S., R. 2 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	77	20,000,000	40,000,000
Red fir	23	6,000,000	11,000,000
Total.....	-----	26,000,000	51,000,000

TOWNSHIP 33 SOUTH, RANGE 1 WEST.

This township comprises chiefly terminations of spurs coming into the Rogue River Valley from the Umpqua-Rogue River divide.

Near the Rogue River the ridges and slopes are low and rocky, with light stands of timber much mixed with many oak copses. Farther back from the river the ridges grow higher, with less oak and heavier stands of pine and fir. Along the creeks and on the benches near the river are settlements in clearings. Fires have run throughout, and 20 per cent of the timber has been culled and cut for domestic and saw-mill uses.

The mill timber remaining is of medium quality. Most of the red fir is of small diameters and the yellow pine is usually short bodied.

Forested and other areas in T. 33 S., R. 1 W., Oregon.

	Acres.
Forested area	20, 240
Nonforested area (glades and agricultural)	2, 800
Badly burned area	3, 500
Logged area (culled)	7, 000

Total stand of timber in T. 33 S., R. 1 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	59. 4	38, 000, 000	60, 000, 000
Sugar pine	4. 7	3, 000, 000	3, 000, 000
Red fir	35. 9	23, 000, 000	47, 000, 000
<i>4</i> Total		64, 000, 000	110, 000, 000

Composition of forest in T. 33 S., R. 1 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	40
Sugar pine .....	. 4
Red fir	53
Oak, madrona, etc.	6. 6

TOWNSHIP 33 SOUTH, RANGE 1 EAST.

Rogue River runs through this township in a southwesterly direction, and the region comprises chiefly rocky and steep slopes on both sides of the river.

The forest has been extensively burned in recent times, and large areas are brush covered in consequence.

The mill timber is badly fire marked and is of inferior quality as a whole.

Forested and other areas in T. 33 S., R. 1 E., Oregon.

	Acres.
Forested area	18,640
Nonforested area (agricultural and meadow, 3,000; burned, 1,400)	4,400
Badly burned area	9,600
Logged area (culled)	2,500

Total stand of timber in T. 33 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	34.1	15,000,000	20,520,000
Sugar pine.....	6.8	3,000,000	3,000,000
Red fir	59.1	26,000,000	33,000,000
White fir			1,500,000
Incense cedar			500,000
Total		44,000,000	58,520,000

Composition of forest in T. 33 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	30
Sugar pine.....	.5
Red fir	64.
White fir	} 5.5
Incense cedar	
Oak	
Madroña.....	

TOWNSHIP 33 SOUTH, RANGE 2 EAST.

The northern areas of the township consist of rocky, bare, or sparsely timbered slopes draining southward into Rogue River. The southern portions comprise moderately high and steep slopes draining partly into Rogue River, partly into Big Butte Creek.

Half of the township is fire marked, the destruction having been the greatest in the northern portion. The timber on these tracts is small and of little value. The southern sections contain heavy bodies of red fir of large growth with intermixed patches of sugar pine, most of which are veterans.

Forested and other areas in T. 33 S., R. 2 E., Oregon.

	Acres.
Forested area	20,540
Nonforested area (glades and agricultural)	2,500
Badly burned area	1,800
Logged area.....	500

Total stand of timber in T. 33 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	12	18, 000, 000	24, 000, 000
Sugar pine.....	2.7	4, 000, 000	4, 600, 000
Red fir	80.6	121, 000, 000	156, 000, 000
White fir	3.3	5, 000, 000	16, 000, 000
Incense cedar .....	.4	500, 000	800, 000
Western hemlock	1	1, 500, 000	2, 400, 000
Total.....		150, 000, 000	203, 800, 000

Composition of forest in T. 33 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine.....	12
Sugar pine.....	2
Red fir	75
White fir	8
Incense cedar	} 3
Western hemlock	
Yew.....	
Oak, madroña.....	

TOWNSHIP 33 SOUTH, RANGE 3 EAST.

This township consists of a plateau region bordering the South and the Middle Fork of Rogue River and the nearly level country between these two forks, together with a broken region in the southern areas draining into the waters of Big Butte Creek.

The northern and central areas bear a forest of very massive proportions; the southern sections carry stands which are comparatively light and much broken by grassy glades and brush growths after fires in recent times. Red fir predominates. It is largely composed of standards, with here and there a group of veterans, frequently with diameters up to 8 feet. The sugar pine occurs throughout and is chiefly composed of veteran stands. Reforestations in the southern areas show a remarkably large percentage of white pine, which, however, is limby and knotty.

The forest in this township is much the heaviest in all the country covered by this report, and shows to some extent the capacity of the region in the line of forest growth where reasonably free from destructive fires. But heavy as is the forest it can not be considered as representing a "fully stocked" area. Fires burned here last summer, destroying much timber. They owed their origin to deer hunters.

To obtain a hundred or two hundred pounds of venison several millions of feet of timber were destroyed.

Forested and other areas in T. 33 S., R. 3 E., Oregon.

	Acres.
Forested area	19,840
Nonforested area (burned, 2,500; glades, 700)	3,200
Badly burned area	4,200
Logged area (culled for domestic purposes)	600

Total stand of timber in T. 33 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	1.7	10,000,000	16,000,000
Sugar pine	15.6	90,000,000	99,500,000
White pine .....	.5	3,000,000	6,000,000
Red fir	77.5	450,000,000	610,500,000
White fir	3.5	20,000,000	65,000,000
Incense cedar .....	.5	2,000,000	3,000,000
Western hemlock .....	.6	3,000,000	6,880,000
Total		578,000,000	806,880,000

Composition of forest in T. 33 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	2
White pine .....	.2
Sugar pine	12
Red fir	75
White fir	10
Incense cedar .....	.1
Western hemlock .....	.2
Yew and madroña .....	.5

TOWNSHIP 33 SOUTH, RANGE 4 EAST.

This township is situated wholly on the western slope of the Cascades, its areas consisting almost entirely of a series of broad, flat terraces between the Middle Fork and South Fork of Rogue River. The canyons of these streams are sunk 300 or 400 feet below the terrace levels, but where the terraces end on the north side of the Middle Fork a lava rim rises to a height of 2,000 feet above the bottom of the canyon.

There are no agricultural or grazing lands in the township.

The run-off flows out by way of the two Rogue River forks. There are no other streams. They carry a large volume of water, have a

swift current, and their beds are littered with large boulders. The South Fork is much the worse in this respect, as it heads in regions that have been subjected to intense glaciation.

The forest belongs to the red-fir type. It has been terribly devastated by fires of modern origin and contains but a fraction of the mill timber that it formerly did. Owing to its location between the two forks of Rogue River access to it for purposes of logging is extremely difficult.

Forested and other areas in T. 33 S., R. 4 E., Oregon.

	Acres.
Forested area	13,140
Nonforested area (chiefly burns).....	9,900
Badly burned area.....	11,000
Logged area.....	None.

Total stand of timber in T. 33 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine			1,000,000
Sugar pine.....	5	4,000,000	6,500,000
Red fir	95	76,000,000	108,000,000
White fir			12,480,000
Total.....		80,000,000	127,980,000

Composition of forest in T. 33 S., R. 4 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	Scattered trees.
Sugar pine	5
White pine	Scattered trees.
Red fir.....	80.8
White fir	10.2
Incense cedar, yew, etc	4

TOWNSHIP 33 SOUTH, RANGE 5 EAST.

Twenty thousand acres of this township are situated on the west slopes of the Cascades and about 3,000 acres on the eastern declivities. The crest line of the range lies along the east line of the township, except in the northeast and southeast corners, where a slight deviation to the west places portions of the township on the eastern slopes of the range.

The western and central areas consist of rocky and precipitous tracts. Especially noteworthy in this respect is the canyon of the Middle Fork of Rogue River. This stream heads in the south-central areas, with three main branches. The northern one lies in a broad

shallow canyon not particularly remarkable, but the southern branch runs in a canyon that has for its west or southwest wall a bluff of lava nearly 2,000 feet in thickness or height. This great mass appears to have issued from two of the craters belonging to the group of five mentioned as occurring in T. 34 S., R. 5 E. The wall of lava presents an immense front to the east, its slopes are extremely steep and rocky and sparsely covered with timber. The opposite or eastern side of the canyon, the course of the stream being northerly in this township, consists of broken terraces and spurs having a moderately easy gradient to the summit of the range. In the northwest corner of the township the stream bends abruptly to the west. The north wall of the canyon is here formed by the front of a mass of lava projected southward from the volcanic area around Union Peak 10 or 12 miles to the north. The front of this lava flow has a thickness from the bottom of the canyon to its summit of nearly 2,800 feet. The eastern portions of the township are formed by the summit of the Cascades. In the southern sections the summit consists of a steep, narrow ridge of lava which ends in the central sections, where the crest is either a succession of narrow lava terraces or a level expanse, in some places fully a mile in width. In the southern portions of the township begins the pumice deposit, which from now on northward covers most of the summit and higher slopes of the range.

The run-off from this township is large. It is probably greater in volume than all the visible drainage from the twelve townships in the reserve south of this one. The outflow is all by way of the Middle Fork of Rogue River. Two of the chief affluents of the fork head directly against the crest of the Cascades. The southern of the two branches has its head in a number of small lakes which are sunk in the hollows of various extinct craters. The northern branch originates in a series of springs, hundreds in number, many of them with a large volume of water. They issue from cracks in a towering bluff of lava, and form a good-sized river in the space of a quarter mile. In addition to these chief branches there are many smaller creeks in the township which feed the volume of the Middle Fork.

No land fit for agriculture exists in the township nor anything that can properly be classed as grazing lands. Some of the fire glades bear scant growth of grass, and sedgy margins border many of the little creeks near the summit of the range. No cattle or sheep are pastured in the township. None of the areas are mineral bearing.

The forest is strictly of the alpine-hemlock type. It has been badly burned and is fire marked throughout. More than half of it is burned to the extent of 50 per cent and over and 25 per cent has been totally destroyed. I doubt if there is a tract of forest as large as 100 acres not fire marked. Reforestation is extremely scanty. Where the forest has not been completely destroyed a thin, sparse growth of lodgepole

pine and alpine hemlock is struggling to maintain itself against heavy snows and winds. Where the timber has suffered total destruction low brush growths are covering the ground. The most prominent and abundant species of brush in these growths is the thin-leaved huckleberry—the common huckleberry of all this region. About 2,500 or 3,000 acres of the township have been transformed from forest into a huckleberry patch.

The mill timber is generally of small stature and diameter. An exception is the alpine hemlock in the canyon of the North Branch of the Middle Fork. The growth is remarkably large, but is overmature and in a state of decay. Much of the stand is from 80 to 100 feet in height, 2 to 3 feet in diameter at the base, with clear trunks 30 to 60 feet long. Throughout all of its parts the township is entirely inaccessible for logging operations.

Forested and other areas in T. 33 S., R. 5 E., Oregon.

	Acres.
Forested area.....	16,540
Nonforested area (bare rocks 700; burned 5,800).....	6,500
Badly burned area.....	9,500
Logged area.....	None.

Total stand of timber in T. 33 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Alpine hemlock.....	84.4	65,000,000	108,000,000
Noble fir.....	13	10,000,000	14,300,000
Engelmann spruce.....	2.6	2,000,000	2,000,000
Total.....		77,000,000	124,300,000

Composition of forest in T. 33 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Alpine hemlock.....	85
Noble fir.....	12
Lodgepole pine.....	} 3
Alpine fir.....	
Engelmann spruce.....	

TOWNSHIP 33 SOUTH, RANGE 6 EAST.

This township lies almost entirely on the eastern slope of the Cascades, a small area in the western sections, which are situated on the summit of the range, overlapping on the western slope. The summit of the Cascades here consists of a broad pumice-covered tract, quite level in some places, in other localities intersected with low combs of

lava sloping off toward the eastern foot of the range in a succession of narrow terraces. Dotting the summit here and there are a number of small, flat-topped volcanic cones long extinct, but geologically of recent origin. With the exception of steep breaks of the terraces and ridges along the summit the region is deeply covered with a mantle of pumice débris. The central portions of the township consist in part of terraced lava flows from the main range, and in part of great spurs of volcanic rock ejected from vents along the slopes of the range. The eastern portions comprise flat, muddy, and partly overflowed lands bordering the swampy areas which fringe the north end of Upper Klamath Lake.

The run-off from the township is mostly carried by Sevenmile Creek, a stream heading exactly on the summit of the Cascades in a low, broad, flat saddle to the northwest of Klamath Point. Its head lies close up against the headwaters of the middle of the three branches of the Middle Fork of Rogue River. The topographical arrangement of the region is such that it would be an easy matter to cause a considerable volume of the water now going into the Middle Fork to flow into the canyon of the Sevenmile, and a cut 50 or 75 feet in depth through the pumice crest of the range would divert most of the upper drainage of this branch of the Middle Fork over to the eastern slope. None of the streams in the township is utilized for irrigation purposes.

About 1,000 acres in the northeast sections of the township can be put to grazing and agricultural use. Most of this tract is covered with lodgepole pine, and portions are periodically subject to overflow from Sevenmile Creek. This area is already occupied by settlers. Outside of this there are no grazing or agricultural lands in the township.

All three of the forest types belonging to the region are represented. The yellow-pine type is the prevailing one at the lowest and middle elevations. The red-fir type occurs as small stands interspersed among the yellow pine. At all the higher altitudes alpine hemlock is the prevailing forest type. Fires have marked the entire forested area in the township, and have swept clean of living timber large tracts. At high elevations there is a slow reforestation process setting in, with lodgepole pine as the leading component. At middle and low elevations brush growths are in the ascendancy on the burned-over tracts.

The mill timber is of poor quality throughout. Most of it is inaccessible for logging operations.

Forested and other areas in T. 33 S., R. 6 E., Oregon.

	Acres.
Forested area	12,940
Nonforested area (chiefly the result of fires)	10,100
Badly burned area	8,000
Logged area	None.

Total stand of timber in T. 33 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	14.8	4,000,000	8,000,000
Sugar pine	11.1	3,000,000	3,000,000
White pine	7.4	2,000,000	2,000,000
Red fir			1,000,000
White fir			10,000,000
Noble fir	11.1	3,000,000	5,000,000
Alpine hemlock	55.5	15,000,000	23,000,000
Engelmann spruce			400,000
Total		27,000,000	52,400,000

Composition of forest in T. 33 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	3
Sugar pine	1
White pine .....	.8
Lodgepole pine.....	30
Red fir .....	.1
White fir	15
Noble fir.....	10
Alpine fir.....	.03
Alpine hemlock	39
Engelmann spruce.....	.1

TOWNSHIP 33 SOUTH, RANGE 7½ EAST.

This township is situated east of the Cascade main range. The eastern areas of the township consist of a level or slightly rolling lava plateau elevated 600 or 700 feet above the level of the nearby Upper Klamath Lake. This tract bears a moderately heavy stand of fair quality yellow pine.

The western and central portions of the township comprise level, marshy, or lodgepole-pine covered tracts, carrying stands of yellow pine where they join the plateau sections in the eastern areas, with the mill timber long since cut away and used in the building of Fort Klamath.

Forested and other areas in T. 33 S., R. 7½ E., Oregon.

	Acres.
Forested area	9,040
Nonforested area (meadow, marsh, and agricultural)	14,000
Logged area (culled 95 per cent)	1,000

Total stand of timber in T. 33 S., R. 7½ E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	80	20, 000, 000	29, 000, 000
Sugar pine	20	5, 000, 000	5, 000, 000
Red fir			100, 000
White fir			7, 450, 000
Incense cedar			850, 000
Total		25, 000, 000	42, 400, 000

Composition of forest in T. 33 S., R. 7½ E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	34
Sugar pine	1.2
Lodgepole pine	60
Red fir	Scattered trees in the eastern areas.
White fir	4.6
Incense cedar .....	.2

TOWNSHIP 33 SOUTH, RANGE 7 EAST.

The western and central areas of this township consist of a level or, in a few places, broken lava plateau lying between the Williamson River and the marshes at the north end of Upper Klamath Lake. The eastern portions of the township comprise the canyon-like valley of the Williamson River, with small tracts of the uplands east thereof.

The areas west of the Williamson River carry most of the mill timber. It is principally composed of open yellow-pine stands, of fair quality and easily logged. The eastern areas are much less timbered. The forest is thin and is broken by numerous grassy glades along the Williamson River. It is fringed with thin stands of lodgepole pine.

The forest is fire marked throughout. Young growth is scanty, and there is but little underbrush in the forest.

The soil is a fine pumice detritus.

Forested and other areas in T. 33 S., R. 7 E., Oregon.

	<i>Acres.</i>
Forested area	21, 440
Nonforested area (meadow, glade, and rocks)	1, 600
Badly burned area	2, 000
Logged area	None

Total stand of timber in T. 33 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	98.9	180,000,000	197,820,000
Sugar pine	1.1	2,000,000	2,000,000
White fir			4,000,000
Incense cedar			500,000
Total		182,000,000	204,320,000

Composition of forest in T. 33 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine.....	75
Sugar pine.....	1
Lodgepole pine.....	20
White fir.....	2
Incense cedar.....	} 2
Cottonwood, etc.....	

TOWNSHIP 33 SOUTH, RANGE 8 EAST.

This township consists of pumice-covered lava ridges and slopes situated east of the Williamson River.

The forest is fire marked throughout. The stand of timber is open and is second rate in quality, the larger proportion being composed of small standards much damaged by the numerous fires which have swept through the forest both in recent and in past times.

Forested and other areas in T. 33 S., R. 8 E., Oregon.

	<i>Acres.</i>
Forested area	22,440
Nonforested area (meadow and agricultural)	600
Badly burned area	3,500
Logged area	None.

Total stand of timber in T. 33 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	120,000,000	147,980,000

Composition of forest in T. 33 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine.....	95
Lodgepole pine.....	5

TOWNSHIP 33 SOUTH, RANGE 9 EAST.

This township is situated east of the Cascade Range, and consists of low, pumice-covered lava ridges rising from elevations of 600 feet to elevations of 1,200 feet above the adjacent areas of Klamath Marsh.

The northern portions of the township contain numerous glades, formed by southward extensions of Klamath Marsh, nonforested, and fringed by stands of lodgepole pine.

The mill timber occurs on the higher slopes. It is fire marked throughout, is of medium quality, and easy of access. It has small interruptions of lodgepole pine, which are reforestations after fires.

Forested and other areas in T. 33 S., R. 9 E., Oregon.

	Acres.
Forested area	16,940
Nonforested area (grassy glades with scattered trees of lodgepole pine)	6,100
Logged area	None.

Total stand of timber in T. 33 S., R. 9 E., Oregon.

Species.	Local practice.		Michigan prac- tice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	50,000,000	101,800,000

Composition of forest in T. 33 S., R. 9 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	80
Lodgepole pine	19.5
White fir .....	.5

TOWNSHIP 33 SOUTH, RANGE 10 EAST.

This township consists of low pumice-covered slopes and ridges having a general rise toward the south where they form, in part, the divide between the Williamson and the Sprague rivers.

The forest is fire marked throughout. It consists of stands of yellow pine of fair quality, above medium density, moderately easy of access from the Williamson Valley side. It is mixed with stands of lodgepole pine and along the crests of the ridges with a thin sprinkling of white fir.

Forested and other areas in T. 33 S., R. 10 E., Oregon.

	Acres.
Forested area	27,840
Nonforested area (glades)	200
Logged area	None.

Total stand of timber in T. 33 S., R. 10 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	100	200, 000, 000	250, 600, 000

Composition of forest in T. 33 S., R. 10 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	90
Lodgepole pine.....	9.5
White fir.....	.5

TOWNSHIP 33 SOUTH, RANGE 11 EAST.

The northern portions of this township consist, in part, of low, level grass-covered slopes bordering the Williamson River, and, in part, of low pumice slopes which help form the Williamson-Sycan divide. The southern areas comprise broken, rocky, or pumice-covered ridges with a central nucleus in Fuego Mountain, an extinct volcano.

The forest along the Williamson River bottoms consists chiefly of stands of small lodgepole pine of various ages. The slopes and ridges carry yellow-pine stands which have been much eaten into by ancient fires whose paths now carry lodgepole-pine reforestations, in their turn ravaged by fires of recent times to the extent of 80 per cent. The mill timber is of fair quality, but contains a large proportion under standards in size.

Forested and other areas in T. 33 S., R. 11 E., Oregon.

	Aeres.
Forested area	21,740
Nonforested area (marsh and glade).....	1,300
Badly burned area.....	5,000
Logged area.....	None.

Total stand of timber in T. 33 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	100	62, 000, 000	131, 800, 000

Composition of forest in T. 33 S., R. 11 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	60
Lodgepole pine.....	39
White fir.....	1

TOWNSHIP 33 SOUTH, RANGE 12 EAST.

This township consists chiefly of nearly level areas deeply covered with pumice and cut by numerous grassy glades along small creeks.

The township contains a small bunch of yellow-pine stands of poor quality in the northwest corner. The balance of the township is covered with stands of lodgepole pine burned to the extent of 65 per cent by fires in recent times, and carrying here and there small scattered stands of yellow pine of little or no commercial value.

Forested and other areas in T. 33 S., R. 12 E., Oregon.

	Acres.
Forested area	21, 040
Nonforested area (glades)	2, 000
Badly burned area	11, 500
Logged area	None.

Total stand of timber in T. 33 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fect. B. M.	Fect. B. M.
Yellow pine	100	25, 000, 000	53, 000, 000

Composition of forest in T. 33 S., R. 12 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	10
Lodgepole pine	90

TOWNSHIP 33 SOUTH, RANGE 13 EAST.

This township consists of a lava plateau to the south of Sycan Marsh. It is in part covered with many narrow, low, and irregular ridges of pumice detritus; in part, through surface denudation and removal of the pumice covering, it consists of large areas with a surface of the rough, underlying lava.

The forest consists of thin stands of yellow and lodgepole pine. The rocky flats between the pumice ridges carry mostly scattered trees. The mill timber occurs on and follows the pumice dunes. It is of poor quality throughout.

Forested and other areas in T. 33 S., R. 13 E., Oregon.

	Acres.
Forested area	16, 040
Nonforested area (meadow, marsh, and glade)	7, 000
Badly burned area	2, 200
Logged area	None.

Total stand of timber in T. 33 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	10, 000, 000	24, 000, 000

Composition of forest in T. 33 S., R. 13 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	65
Lodgepole pine	35

TOWNSHIP 33 SOUTH, RANGE 14 EAST.

The township is situate southward from Sycan Marsh and comprises mostly flats covered with lodgepole pine. The forest is chiefly composed of lodgepole pine. This township was not examined personally, but estimated from information.

Forested and other areas in T. 33 S., R. 14 E., Oregon.

	Acres.
Forested area	13, 040
Nonforested area (marsh)	10, 000
Logged area	None.

Total stand of timber in T. 33 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	4, 000, 000	10, 000, 000

TOWNSHIP 34 SOUTH, RANGE 2 WEST.

The eastern areas of this township consist of bench lands bordering Rogue River. They are thinly forested or quite bare of timber. The western portions consist of low spurs projecting southward from the Umpqua-Rogue River divide, and bear most of the forest.

The region is fire marked throughout. The mill timber is scattered and of poor quality, having largely been culled during many years for domestic purposes.

Forested and other areas in T. 34 S., R. 2 W., Oregon.

	Acres.
Forested area	21, 040
Nonforested area (agricultural and grazing)	2, 000
Badly burned area	3, 000
Logged area (culled)	5, 000

Total stand of timber in T. 34 S., R. 2 W., Oregon.

Species:	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	66.6	6,000,000	16,000,000
Sugar pine.....			1,500,000
Red fir.....	33.4	3,000,000	5,000,000
Incense cedar.....			500,000
Total.....		9,000,000	23,000,000

Composition of forest in T. 34 S., R. 2 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine.....	80
Red fir.....	15
Sugar pine.....	} 5
Incense cedar.....	
Oaks, etc.....	

TOWNSHIP 34 SOUTH, RANGE 1 WEST.

This township comprises a mass of low, broken lava and serpentine spurs situated between Rogue River and Big Butte Creek.

The forest is light, open, and is largely composed of oak copses, much of the more valuable mill timber having long since been cut away. The slopes fronting on Rogue River have been badly burned and are grown up with brush.

Forested and other areas in T. 34 S., R. 1 W., Oregon.

	<i>Acres.</i>
Forested area.....	20,540
Nonforested area (agricultural and grazing).....	2,500
Badly burned area.....	1,500
Logged area (culled).....	15,000

Total stand of timber in T. 34 S., R. 1 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	100	3,000,000	12,000,000
Red fir.....			4,000,000
Total.....		3,000,000	16,000,000

Composition of forest in T. 34 S., R. 1 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	85
Red fir	10
White fir	} 5
Oak	
Cottonwood	

TOWNSHIP 34 SOUTH, RANGE 1 EAST.

This township consists of low, rocky, broken slopes and ridges draining into Big Butte Creek, which nearly bisects the township.

The forest is thin and scanty. The western half of the township is mostly covered with copses of low scrub oaks. The eastern areas, which formerly bore good stands of timber, have been largely logged clean, or rather closely culled.

Forested and other areas in T. 34 S., R. 1 E., Oregon.

	Acres.
Forested area	16,640
Nonforested area (agricultural and rocks, 5,000; burned, 1,400)	6,400
Badly burned area	2,000
Culled area (20 to 60 per cent)	6,000
Logged area	6,000

Total stand of timber in T. 34 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fect B. M.	Fect B. M.
Yellow pine	38.1	8,000,000	12,000,000
Sugar pine	14.3	3,000,000	3,480,000
Red fir	47.6	10,000,000	15,410,000
White fir			3,910,000
Total		21,000,000	34,800,000

Composition of forest in T. 34 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	38
Sugar pine	8
Red fir	50
White fir	} 4
Incense cedar	
Oak, etc	

TOWNSHIP 34 SOUTH, RANGE 2 EAST.

The central portion of this township is formed by the divide between the Big Butte Creek and its northern fork. The western and eastern sections consist of the west and east slopes of this ridge.

The upper western slopes, the summit, and the eastern slopes of the ridge carry heavy stands of an excellent quality of mill timber where not burned. The lower slopes on the western side are mostly barren or rocky, and are lightly timbered or have had their forest logged off.

Fires have run through about one-half of the township, badly burning portions of the western slope. The results have been brush-covered areas, slowly reforesting with red fir.

Forested and other areas in T. 34 S., R. 2 E., Oregon.

	Acres.
Forested area	19,240
Nonforested area (agricultural and grazing)	3,800
Badly burned area	2,800
Logged area	3,000

Total stand of timber in T. 34 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	20	28,000,000	34,000,000
Sugar pine	8	11,000,000	12,000,000
Red fir	68.9	95,000,000	118,000,000
White fir	2.3	3,000,000	10,000,000
Incense cedar .....	.8	1,000,000	1,690,000
Western hemlock			1,000,000
Total		138,000,000	176,690,000

Composition of forest in T. 34 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	20
Sugar pine	8
Red fir	65
White fir	5
Incense cedar	
Western hemlock	2
Oaks, yew	

TOWNSHIP 34 SOUTH, RANGE 3 EAST.

This township is situated on slopes draining partly into the North Fork of Big Butte Creek and partly into the Middle Fork of Rogue River. The region is much cut up by numerous low ridges and narrow canyons.

Fires have run throughout the township in recent times; there being few tracts not fire marked. Reforestation is good in the western and central areas, but deficient in the eastern, where brush growths are apt to prevail after fires. Most of the mill timber occurs in the western areas. It is of fair quality, but contains a large amount of material with deficient clear trunk development. It is comparatively easy of access.

Forested and other areas in T. 34 S., R. 3 E., Oregon.

	Acres.
Forested area	20,540
Nonforested area (glades, 500; burned, 2,000)	2,500
Badly burned area	3,200
Logged area (culled for domestic purpose)	500

Total stand of timber in T. 34 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	19.1	50,000,000	90,000,000
Sugar pine	7.7	20,000,000	24,000,000
Red fir	67	175,000,000	234,000,000
White fir	4.6	12,000,000	38,000,000
Western hemlock			1,000,000
Incense cedar	1.5	4,000,000	5,360,000
Total		261,000,000	392,360,000

Composition of forest in T. 34 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	15.
Sugar pine	5.
Red fir	60.
White fir	18.5
Western hemlock .....	.05
Incense cedar	1.

TOWNSHIP 34 SOUTH, RANGE 4 EAST.

The position of this township is west of the main range of the Cascades. It is separated from the slopes leading directly to the summit of the range by the intervening canyon of South Fork of Rogue River. This canyon enters the township at its southeastern corner and cuts

across it in a northwesterly direction. About two-thirds of the township areas are comprised in the bottom and slopes of this canyon. The remainder, the western sections, consists of western declivities of the divide between South Fork of Rogue River and North Fork of Big Butte Creek. Almost the entire area of the township is rocky and abounds in precipitous slopes. Where these have a more gentle gradient they are strewn with boulders and smaller fragments of glaciated lava. The ridge which bounds the South Fork Canyon on the west is especially rocky and boulder strewn. The bottom of the canyon is littered with glacial débris, such as lava blocks torn off the inclosing canyon walls or transported from the base of Mount Pitt. There are also gravel terraces, which mark the former existence of lateral and terminal moraines.

The drainage of the township flows into Rogue River, most of it by way of the South Fork of this stream, only an inconsiderable quantity by way of North Fork of Big Butte Creek. The volume of water in the Rogue River Fork is small until near its point of exit from the township, where it is greatly augmented by the entrance of a large tributary from the east and by the quantity received from numerous big springs issuing from under the lava.

The township contains no agricultural land. The grazing areas consist of fire glades in the western portions—slopes which were burned over thirty or forty years ago and have neither become reforested nor grown up to brush, but are covered with a scanty sward of coarse grass or sedge. Cattle in small numbers range on these fire glades. No sheep are pastured in the township. None of the lands are mineral bearing so far as known.

The forest in the township consists mainly of stands belonging to the alpine-hemlock type. Small tracts bearing stands of red-fir type occur in the southwest corner. Most of the timber is of small size, averaging less than 18 inches in basal diameter, and is defective from various forms of rot due to severe and often recurring fires.

Forest fires have ravaged large areas of the township. The larger portions of the central regions have been utterly laid waste through this cause, the burns being northward extensions of the great fire-swept areas in township 35 adjoining on the south. On slopes facing west brush growths are covering the burned-over land with almost impenetrable thickets of chaparral. On eastern declivities leading into the South Fork of Rogue River Canyon are large tracts on which neither tree nor brush has as yet obtained a lodgment, nothing but a scant growth of weeds marking the site of the burned forest.

Forested and other areas in T. 34 S., R. 4 E., Oregon.

	Acres.
Forested area	15,340
Nonforested area (chiefly burned clean)	7,700
Badly burned area	8,000
Logged area	None.

Total stand of timber in T. 34 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fect B. M.	Fect B. M.
Yellow pine	4.9	3,000,000	6,500,000
Red fir	13.1	8,000,000	13,000,000
White fir			2,800,000
Noble fir	32.8	20,000,000	25,000,000
Alpine hemlock	32.8	20,000,000	40,000,000
Engelmann spruce	16.4	10,000,000	21,000,000
Total		61,000,000	108,300,000

Composition of forest in T. 34 S., R. 4 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	3
Sugar pine	Scattered trees.
White pine	Scattered trees.
Lodgepole pine	10
Red fir	4
White fir	2
Noble fir	20
Alpine fir	1
Alpine hemlock	40
Engelmann spruce	20

TOWNSHIP 34 SOUTH, RANGE 5 EAST.

The lines of this township include areas situated on both sides of the crest of the main range of the Cascades. The summit of the range strikes through the central sections, almost in a straight north-south line. The crest of the range in this township consists of an old lava flow about three-fourths of a mile in width which appears to have come from a group of now extinct craters situated near the northern boundary. This lava stream shows marks of past glaciation; it is thinly covered with soil and in some places is extremely rough with loose blocks and boulder accumulations. The western sections of the township consist of rough, rocky slopes descending into the canyon of the South Fork of Rogue River. A glaciated lava plateau abounding in low, intersecting morainic ridges of rough lava blocks comprises the southern portion of the eastern sections. Scattered over the surface of the plateau are scores of lakelets sunk in shallow depressions or held between ridges of glacial origin. Most of these lakelets have no visible outlet. The northern portion of the eastern areas of the township consists, in part, of the upper portion of Cherry Creek Canyon, a drainage channel largely owing its existence to glacial erosion, its bottom sunk a thousand feet below the level of the plateau

through which it has been cut, and opening into the marshy areas of Upper Klamath Lake. The remainder of the township comprises rough lava fields and high ridges which represent the remains of crater rims and interiors of a huge group of extinct volcanic vents. The group of craters here referred to, situated in the north-central portions of the township, forms one of the most interesting and remarkable of all the volcanic centers in this part of the Cascade Range. Originally it consisted of five craters grouped around a nucleus of very ancient lava which undoubtedly was ejected from still older craters. The diameters of the entire system were 3 miles north and south by 5 miles east and west, and the mountain around which the craters are grouped, now appearing as a narrow, jagged, sharp-crested ridge, rises to a height of about 7,200 feet above sea level. Most of the rims of the craters have long since been blown away by volcanic eruptions or cut out by glaciers which appear to have filled the craters to a depth of 1,000 or 1,500 feet. When these volcanoes were active they ejected vast streams of lava on all sides. Two of these streams, one south, the other northeast of the group, now constitute the crest of the Cascades in this locality.

The run-off from the township in part flows into Rogue River by way of its South Fork, in part empties into Upper Klamath Lake through Cherry Creek. Apparently, less of the precipitation sinks and more runs away as visible drainage than is the case in the township south, for both of the streams mentioned carry a large volume of water in their courses through the township. Most of the water in Cherry Creek is derived from two large creeks heading in the glaciated plateau area to which allusion has previously been made. These creeks probably are fed by leakage from the many lakes which dot the plateau surface. Numerous lakelets and pools are found among the group of five craters. Some of them are situated in depressions in the ancient vents, others are perched high up in little niches or on narrow benches and terraces which have been excavated in the precipitous walls of the cliffs by glacial agencies. The upper portion of Cherry Creek Canyon discloses in great perfection evidences which prove the former existence of moving masses of ice in this valley. They consist of numerous narrow ledges of rock, having their long axis parallel with the direction of the canyon. In some localities these ridges of rock have been smoothly polished by the moving ice masses; in other places they are deeply scored by long, straight grooves from west to east, proving that the ice slid toward the basin now covered with Upper Klamath Lake.

There are no agricultural or grazing lands in the township.

The forest belongs to the alpine-hemlock type. Fires have everywhere ravaged it. The upper portion of the Cherry Creek drainage basin and the areas adjacent to the base of the group of extinct volcanoes previously mentioned have been burned very near clean of their

forest cover. Most of the standing timber is of small size, being chiefly reforestations after fires which denuded the region a decade or two anterior to the advent of the white man. A large proportion is lodgepole pine. Some consists of small scraggy alpine hemlock and white pine.

The mill timber is of poor quality throughout. The soil is too thin to grow big timber and the numerous fires which have devastated the region have badly damaged what they have not consumed. More than 75 per cent of the stands are composed of trees with basal diameters below 18 inches.

The region is generally inaccessible for logging operations. The only areas that can be reached are the Cherry Creek bottoms along the eastern edge of the township, but the tract does not carry enough timber to pay the cost of constructing roads to reach it.

At the present time no mineral bearing areas are known in the township, but it is not unlikely that ground of this kind may be discovered in the region adjoining the group of ancient volcanoes. Lavas of the kind found in that locality have elsewhere been known to carry gold.

The areal and timber estimates for the township are as follows:

Forested and other areas in T. 34 S., R. 5 E., Oregon.

	Acres.
Forested area	19, 140
Nonforested area (bare rocks 2,000, burned 1,900)	3, 900
Badly burned area	8, 500
Logged area	None.

Total stand of timber in T. 34 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Noble fir	41.6	5, 000, 000	10, 000, 000
Alpine hemlock	50	6, 000, 000	17, 000, 000
Engelmann spruce	8.4	1, 000, 000	4, 280, 000
Total		12, 000, 000	31, 280, 000

Composition of forest in T. 34 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Lodgepole pine	70
Noble fir	10
Alpine fir	3
Engelmann spruce	} 2
Yew	
White pine	} 15
Alpine hemlock	

TOWNSHIP 34 SOUTH, RANGE 6 EAST.

The region comprised within the limits of this township is situated on the eastern slope of the Cascades. Most of it is a rocky, barren, desolate tract of country. The western and central portions of the township consist of broad, glaciated terraces of lava flanking the main crest of the Cascades. Along the eastern edge of this terraced region, where it breaks off to the slopes which lead down to the levels at the foot of the range, are ranges of broken, irregular combs and hills, perhaps the remains of ancient crater rims. The eastern sections comprise a narrow, level, boulder-strewn terrace at the foot of the range and a strip of marshy meadow fringing Upper Klamath Lake.

The region is drained by Threemile and Cherry creeks; of the latter only the lower portion lies within the lines of this township. There also are a few insignificant rivulets and small springs. Cherry Creek carries a large volume of water during spring and early summer, but later diminishes very much in size; Threemile Creek is a stream of trifling proportions. The waters of both creeks are utilized for irrigation purposes in a small way by ranchers in the vicinity. It is self-evident that most of the rain water falling on the areas of this township sinks in crevices of the lava and is lost, for Cherry Creek, the largest stream in the township, gets most of its water from the next township west and south, and the outflow in other localities is trifling in amount.

There are a few hundred acres of land that by a stretch of imagination can be classed as agricultural. It is all contained in the narrow boulder terrace at the foot of the range. There are no grazing lands in the mountain areas. The lava ridges and terraces in those portions of the township are mostly too barren and rocky to sustain even a grass or sedge growth.

The forest consists of stands of red-fir and of yellow-pine types at low elevations, while at high altitudes and in the wet and swampy bottoms of Middle Cherry Creek the alpine-hemlock type is the prevailing one. The yellow pine is of fair quality and is only moderately difficult of access. The greatest quantity and the largest dimensions occur at the mouth of Cherry Creek. Most of the really valuable mill timber in the township exists in the bottoms and on the slopes adjacent to that stream. In some places where the bottoms are swampy there are heavy stands of Engelmann spruce averaging 90 to 110 feet in height, with diameters 3 to 4 feet, 2 feet from the ground, and clear trunks from 40 to 60 feet in length. Mixed with the spruce are numbers of veteran red firs of large size; some were seen with diameters of 7 feet. In the western portions of the township most of the forest is of small dimensions and is chiefly composed of lodgepole pine, alpine hemlock, and noble fir.

Fire has marked the forest in all portions of the township. The damage due to this cause has been especially severe and extensive in the western areas, where most of the destruction has been done since the white man's occupancy of the country. In late years big fires in Cherry Creek Canyon have destroyed 30 per cent of the only really valuable mill timber in the township. About midway up that canyon are large salt or alkali licks that have from time immemorial been the gathering place for all the deer in the surrounding country. A good many hunting parties also come here to slay the deer at the licks; fires are the inevitable result.

Reforestation of the burned-over areas are few and thin. Most of the young forest outside the yellow-pine areas consists of lodgepole pine. Where the yellow-pine stands have been destroyed heavy brush growths of the vellum-leaved ceanothus have followed. On a few of the higher elevations facing east and south the forest has been replaced with a thin sward of grass. In the burns which have occurred in the alpine-hemlock type large tracts are entirely bare of vegetation.

No mineral-bearing areas are known in the township.

Forested and other areas in T. 34 S., R. 6 E., Oregon.

	Acres.
Forested area	13,440
Nonforested area (marsh and rocks, 6,000; burned, 3,600).....	9,600
Badly burned area	4,000
Logged area.....	None.

Total stand of timber in T. 34 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	20	10,000,000	20,000,000
White pine	2	1,000,000	1,540,000
Red fir	10	5,000,000	8,500,000
White fir	16	8,000,000	38,000,000
Noble fir	34	17,000,000	25,000,000
Alpine hemlock.....	6	3,000,000	9,000,000
Engelmann spruce	12	6,000,000	8,000,000
Total		50,000,000	110,040,000

Composition of forest in T. 34 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	20
White pine.....	2
Lodgepole pine.....	1
Red fir.....	8
Noble fir.....	25
White fir.....	30
Alpine hemlock.....	10
Engelmann spruce.....	5

TOWNSHIP 34 SOUTH, RANGE 7½ EAST.

This township consists chiefly of wet, swampy, and overflowed lands adjoining Upper Klamath Lake, with small areas of higher land in the eastern portions, which bear thin stands of yellow pine of little commercial value. Lodgepole pine fringes all the marshy tracts, with here and there willow and poplar groves.

Forested and other areas in T. 34 S., R. 7½ E., Oregon.

	Acres.
Forested area.....	1,200
Nonforested area (marsh and lake).....	21,840
Logged area.....	None.

Total stand of timber in T. 34 S., R. 7½ E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine.....			3,600,000

Composition of forest in T. 34 S., R. 7½ E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	30
Lodgepole pine.....	70

TOWNSHIP 34 SOUTH, RANGE 7 EAST.

This township consists of a lava plateau situated between Upper Klamath Lake and Williamson River, with portions of a similar plateau east of the Williamson in the eastern sections of the township.

The forest is fire marked throughout. The fire glades in the eastern areas are covered with brush or lodgepole pine. In the western portions they are reforesting with yellow pine.

The mill timber is of medium quality, being knotty in the log, although clear in exterior appearance. It is easy of access. The southern areas of the township have practically been logged clean for Indian uses at and around Klamath Agency. The northern portions still carry considerable timber.

Forested and other areas in T. 34 S., R. 7 E., Oregon.

	Acres.
Forested area	17, 280
Nonforested area (marsh and lake)	5, 760
Badly burned area.....	1, 000
Logged area (95 per cent).....	5, 000

Total stand of timber in T. 34 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	92. 1	35, 000, 000	48, 000, 000
Sugar pine.....	7. 9	3, 000, 000	3, 000, 000
White fir.....			2, 000, 000
Incense cedar			240, 000
Total.....		38, 000, 000	53, 240, 000

Composition of forest in T. 34 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	95
Sugar pine	1. 8
White fir	3
Incense cedar, etc. ....	. 2

TOWNSHIP 34 SOUTH, RANGE 8 EAST.

This township comprises rocky, flat lava tracts in the northern and central portions, with low ridges of volcanic origin in the southern areas.

The forest is fire marked throughout. The central portions are thinly forested or are bare of timber growth owing to their semiarid conditions.

The mill timber is of inferior quality throughout.

Forested and other areas in T. 34 S., R. 8 E., Oregon.

	Acres.
Forested area	12, 160
Nonforested area (semiarid grazing land)	10, 880
Logged area.....	None.

Total stand of timber in T. 34 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	95. 6	15, 000, 000	28, 400, 000
Sugar pine.....	4. 4	700, 000	700, 000
White fir.....			1, 300, 000
Total.....		15, 700, 000	30, 400, 000

Composition of forest in T. 34 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	85
Lodgepole pine.....	14
Sugar pine.....	1
White fir.....	1

TOWNSHIP 34 SOUTH, RANGE 9 EAST.

The central and southwestern areas of this township consist of a nearly level, semiarid lava plateau, bordering portions of the Sprague River throughout. With the exception of scattered trees of yellow pine, the tracts are devoid of forest.

The northern and eastern sections of the township comprise low ridges and hills, and bear thin stands of yellow pine of inferior quality.

Forested and other areas in T. 34 S., R. 9 E., Oregon.

	Acres.
Forested area.....	12,800
Nonforested area (meadow, agricultural, and semiarid).....	10,240
Logged area.....	None.

Total stand of timber in T. 34 S., R. 9 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fect B. M.	Fect B. M.
Yellow pine.....	100	12,000,000	30,000,000

Composition of forest in T. 34 S., R. 9 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	98
Lodgepole pine.....	2

TOWNSHIP 34 SOUTH, RANGE 10 EAST.

This township consists of rocky lava slopes of the divide between the Williamson and the Sprague rivers.

The forest is open, and the growth is thin and mostly of small dimensions, except in the extreme northern areas, where heavy stands of yellow pine of fair quality occur.

Forested and other areas in T. 34 S., R. 10 E., Oregon.

	Acres.
Forested area.....	23,040
Logged area.....	None.

Total stand of timber in T. 34 S., R. 10 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	38,000,000	70,000,000

Composition of forest in T. 34 S., R. 10 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	98
Lodgepole pine	2

TOWNSHIP 34 SOUTH, RANGE 11 EAST.

The southwestern areas of this township are covered with an open growth of yellow pine, and consist mostly of rocky hillsides. The southeastern sections are formed of a comparatively flat, rocky, lava plateau bordering Sycan River, and are nearly devoid of timber. The northern areas comprise slopes of Fuego Mountain, and are covered with medium dense stands of yellow pine of fair quality, but difficult of access. The yellow pine is fire marked throughout, and is mixed with stands of lodgepole pine and scattered trees of white fir.

Forested and other areas in T. 34 S., R. 11 E., Oregon.

	<i>Acres.</i>
Forested area	15,040
Nonforested area (grazing and semiarid)	8,000
Badly burned area	2,100
Logged area	None.

Total stand of timber in T. 34 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	48,000,000	77,300,000
White fir			1,700,000
Total		48,000,000	79,000,000

Composition of forest in T. 34 S., R. 11 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	90
Lodgepole pine	9
White fir	1

TOWNSHIP 34 SOUTH, RANGE 12 EAST.

This township consists of rocky lava slopes on the western declivities of a range of hills known as the Black Hills.

Fires have run throughout the township. The timber is chiefly made up of stands of yellow pine of medium density and quality, difficult of access, and interspersed with scattered trees of sugar pine, white fir, small incense cedar, and thin stands of lodgepole pine.

Forested and other areas in T. 34 S., R. 12 E., Oregon.

	Acres.
Forested area	13,840
Nonforested area (grazing and semiarid, 8,000; burned, 1,200)	9,200
Badly burned area	3,000
Logged area	None.

Total stand of timber in T. 34 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	99	75,000,000	94,000,000
Sugar pine	1	700,000	700,000
White fir			1,200,000
Incense cedar			100,000
Total		75,700,000	96,000,000

Composition of forest in T. 34 S., R. 12 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	85
Sugar pine .....	.5
Lodgepole pine	14
White fir .....	.4
Incense cedar	Scattered trees.
Western juniper	Scattered trees.

TOWNSHIP 34 SOUTH, RANGE 13 EAST.

This township consists of a rolling, hilly region of little elevation above the near-by Sprague River Valley, formed by the eastward extending spurs of the Black Hills.

The forest is everywhere fire marked; the greatest damage has been done on the immediate eastern slopes of the Black Hills, where in many localities the timber has been totally destroyed and brush growths have taken its place.

The mill timber forms good stands, excellent in quality, and readily accessible from the Sprague River Valley.

FOREST RESERVES.

Forested and other areas in T. 34 S., R. 13 E., Oregon.

	Acres.
Forested area	23,040
Badly burned area	1,200
Logged area.....	None.

Total stand of timber in T. 34 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	93.7	130,000,000	147,000,000
Sugar pine.....	2.1	3,000,000	3,000,000
White fir	3.6	5,000,000	17,000,000
Incense cedar .....	.6	800,000	1,000,000
Total		138,800,000	168,000,000

Composition of forest in T. 34 S., R. 13 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	85
Sugar pine.....	.25
Lodgepole pine.....	5
White fir	9
Incense cedar.....	.75

TOWNSHIP 34 SOUTH, RANGE 14 EAST.

This township was not examined personally, but was estimated from information.

Forested and other areas in T. 34 S., R. 14 E., Oregon.

	Acres.
Forested area	15,040
Nonforested area	8,000
Logged area.....	None.

Total stand of timber in T. 34 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	83.3	25,000,000	40,000,000
Sugar pine.....	5	1,500,000	1,500,000
White fir	10	3,000,000	8,000,000
Incense cedar.....	1.6	500,000	500,000
Total		30,000,000	50,000,000

TOWNSHIP 35 SOUTH, RANGE 2 WEST.

This township consists of low ridges with open, rolling valleys between, mostly devoid of forest and covered with thick growths of chaparral (*Ceanothus cuneatus*) where not under cultivation. The forested areas carry thin stands and lines of yellow pine, with scattered trees of red fir and numerous copses of low-growing oaks.

The hilly portions were formerly more heavily wooded, but have been swept by fires and transformed into chaparral-covered slopes.

Forested and other areas in T. 35 S., R. 2 W., Oregon.

	Acres.
Forested area	3,000
Nonforested area (meadow, agricultural, and grazing).....	20,040
Logged area (culled of its mill timber).....	All.

Total stand of timber in T. 35 S., R. 2 W., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine			1,600,000
Red fir			700,000
Total.....			2,300,000

Composition of forest in T. 35 S., R. 2 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	8
Red fir .....	.2
Oak, cottonwood, etc	91.8

TOWNSHIP 35 SOUTH, RANGE 1 WEST.

This township consists of low ridges and semiarid flats, mostly draining into Reese Creek, a tributary of Rogue River.

The forest is principally scattered oak copses, with small areas of well-culled yellow pine and red fir in the eastern sections.

The mill timber is small and unimportant.

Forested and other areas in T. 35 S., R. 1 W., Oregon.

	Acres.
Forested area	5,000
Nonforested area (meadow, agricultural, and grazing)	18,040
Badly burned area	800
Logged area (culled)	All.

FOREST RESERVES.

Total stand of timber in T. 35 S., R. 1 W., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine			3,000,000
Red fir			1,000,000
Total.....			4,000,000

Composition of forest in T. 35 S., R. 1 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	} 2
Red fir	
Oak	98

TOWNSHIP 35 SOUTH, RANGE 1 EAST.

This township consists of slopes draining west into Rogue River and east into Big Butte Creek. The western slopes are terraced, rocky benches, thinly forested. The eastern portions of the township slope gradually into Big Butte Valley, and are covered with moderate stands of yellow pine and red fir of inferior quality along the upper levels.

The forest is everywhere fire marked.

Forested and other areas in T. 35 S., R. 1 E., Oregon.

	Acres.
Forested area.....	10,240
Nonforested area (agricultural and grazing, 11,000; burned, 1,800).....	12,800
Badly burned area.....	1,500
Logged area.....	4,800

Total stand of timber in T. 35 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	72.7	8,000,000	14,000,000
Red fir	27.3	3,000,000	8,000,000
White fir			2,000,000
Total.....		11,000,000	24,000,000

Composition of forest in T. 35 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	50
Sugar pine.....	Scattered trees.
Red fir	30
White fir	5
Incense cedar.....	Scattered trees.
Oak	15

TOWNSHIP 35 SOUTH, RANGE 2 EAST.

This township comprises a mass of steep and broken ridges, situated between the North Fork of Little Butte and the South Fork of Big Butte creeks.

The central and southeastern areas contain the best and heaviest mill timber. It is of fair quality and easy of access.

A large proportion of the township is settled and much of the forest has either been cleared away for agricultural purposes or logged for sawmill and domestic uses. The sugar pine has suffered severely from the shake makers. Millions of feet have been cut down and, proving difficult to split, have been allowed to lie where they fell unused.

Fires have marked the forest everywhere in the township.

Forested and other areas in T. 35 S., R. 2 E., Oregon.

	Acres.
Forested area.....	19,840
Nonforested area (agricultural and grazing)	3,200
Badly burned area.....	4,700
Logged area (culled).....	6,000

Total stand of timber in T. 35 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	21.5	20,000,000	28,000,000
Sugar pine.....	3.2	3,000,000	4,500,000
Red fir	75.3	70,000,000	98,000,000
White fir.....			11,000,000
Incense cedar.....			3,600,000
Total.....		93,000,000	145,100,000

Composition of forest in T. 35 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	30
Sugar pine.....	1
Red fir	55
White fir.....	5
Incense cedar.....	2
Oak.....	7

TOWNSHIP 35 SOUTH, RANGE 3 EAST.

This township is situated on the headwaters of the South Fork of Big Butte Creek, and consists of level areas traversed by occasional low ridges; the entire region of volcanic origin.

The central areas contain a large quantity of agricultural and grazing land, most of it settled upon. The balance is covered with a

moderately uniform, heavy forest stand, in which yellow pine largely predominates. The mill timber is of good dimensions and quality. The forest is fire marked throughout.

The sugar pine in the township has been badly culled by shake makers. Agricultural claims have been entered in the heavy timber, the sugar pine fit for shakes cut off, and the entry abandoned. Great quantities of large sugar pine lie rotting on the ground—cut down, found to split hard, and rejected. Almost every sugar pine of any considerable size in the township is ax marked, to try its splitting qualities.

Forested and other areas in T. 35 S., R. 3 E., Oregon.

	Acres.
Forested area	20,040
Nonforested area (glades and meadow, 1,500; burned, 1,500)	3,000
Badly burned area	500
Logged area (the sugar pine culled 10 per cent)	12,000

Total stand of timber in T. 35 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	54.8	125,000,000	160,000,000
Sugar pine	4.4	10,000,000	11,000,000
Red fir	37.3	85,000,000	109,000,000
White fir	2.6	6,000,000	12,000,000
Incense cedar .....	.9	2,000,000	3,000,000
Total		228,000,000	295,000,000

Composition of forest in T. 35 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	70
Sugar pine	3
Red fir	20
White fir	5
Incense cedar .....	.5
Oaks, etc	1.5

TOWNSHIP 35 SOUTH, RANGE 4 EAST.

This township lies well over on the western slopes of the main range of the Cascades, owing to a curve in the crest line toward the east after leaving Mount Pitt.

The western portion of the township consists of a series of low, narrow terraces parallel to the crest of the range, each terrace appearing to mark the outer rim of successive lava flows. The central and eastern areas comprise boulder-strewn slopes rising with an easy gradient toward the crest.

The drainage from the township is small in amount and is mostly contained in Clark Fork and Fourmile Creek, which head in the township. Eventually it finds its way into Rogue River through Big Butte Creek. The waters of the streams flowing from the township are used locally, in a small way, for irrigation purposes.

The township has been heavily forested. All the heavy stands have been burned in recent times; that is to say, since the advent of the white man. The southern boundary of the township marks the beginning of the immense burns, which stretch northward along the summit and the immediate western declivities of the main range for a distance of at least 40 miles. Throughout the central and western areas of the township and almost through the next one north, a distance of about 11 miles with a width of 5 miles, there is one solid burn, where scarcely a tree is to be seen outside of the swampy or wet slopes of a few of the larger canyons. It is the most thorough and complete sweep of a standing forest by fire that I have ever seen. The burned areas have become covered with brush composed of huckleberry, manzanita, garrya, service berry, and vellum-leaved ceanothus, the latter being the most abundant and conspicuous species.

No reforestation are visible, as yet, on these tracts. The western areas have suffered comparatively little from fire.

The forest is mostly of the yellow-pine type, small stands of red-fir type occur here and there, and thin lines of alpine-hemlock type follow the upper courses of some of the canyons which supply Clark Fork and Four Bit Creek. The stands of yellow-pine type are of considerable value and easy of access. They are found in the western portion of the township on the different terraces. The trees are remarkably thick set. Sometimes there are 80 trees per acre of logging size, a large number for stands of the yellow-pine type. Another remarkable feature of these stands is the short clear trunk and low stature of most of the trees. The greater number will not average much over 18 feet in clear trunk and 20 inches in diameter. These yellow-pine stands are much mixed with California black oak and Pacific post oak. I know of no place in this region where the oaks approach the crest line of the Cascades so closely in their range as in this township. In a straight line their farthest easterly station is not more than 8 miles from the summit.

All of the commercially valuable timber can easily be logged from the west via the Rancheria-Fort Klamath wagon road.

No mineral-bearing areas are known to occur in the township.

There is neither agricultural nor grazing land in the township. The forest floor in the yellow-pine stands is covered with a thin growth of grass, which is occasionally visited by bands of stock. Its value is unimportant.

Forested and other areas in T. 35 S., R. 4 E., Oregon.

	Acres.
Forested area	12,240
Nonforested area (chiefly burned)	10,800
Badly burned area	12,000
Logged area	None.

Total stand of timber in T. 35 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	57.8	52,000,000	69,000,000
Red fir	27.7	25,000,000	42,000,000
White fir			2,750,000
Noble fir	11.1	10,000,000	15,000,000
Alpine hemlock	3.3	3,000,000	6,000,000
Total		90,000,000	134,750,000

Composition of forest in T. 35 S., R. 4 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	48
Sugar pine	Scattered trees.
White pine	Scattered trees.
Lodgepole pine	Scattered trees.
Red fir	30
White fir	1
Noble fir	14.5
Alpine hemlock	5
Oak	1.5

TOWNSHIP 35 SOUTH, RANGE 5 EAST.

This township is situated in part on the western slopes and in part on the eastern declivities of the Cascades, the crest line of the range passing through it from north to south, a little west of the center. The summit of the range consists of a plateau-like area having a mean elevation of 6,000 feet. A narrow, low ridge of lava along the western edge of the plateau forms the crest. A low ridge of lava stretches across from east to west, connecting the extinct volcanic cone, Lost Peak, with the volcanic areas along the crest. The plateau extends eastward and covers all of the eastern sections of the township. It has been extensively glaciated, and as a result low ridges consisting of blocks of lava are heaped up and surround shallow depressions which hold small lakelets, most of which have no visible outlet.

The western portion of the township consists of areas sloping into the canyon of South Fork of Rogue River, which heads near the southern line of the township. Near its head the stream lies mostly in a narrow, rocky valley, immense crags and cliffs forming

the western wall of its canyon. The eastern side slopes back more gradually.

The headwaters of South Fork of Rogue River drain the western part of the township. The stream heads in a number of lakes, the largest of which is $1\frac{1}{2}$ miles in length and 350 or 400 yards in width. These lakes are situated in the bottom of the canyon and are known as Blue Canyon lakes. Within the township the South Fork of Rogue River is a small rivulet; its canyon, while narrow, is entirely out of proportion to the small volume of water now flowing through it. As with many other streams in the region, the amount of water in its upper portions does not anywhere near account for the quantities which must be shed from the adjacent slopes. The southern areas of the eastern sections of the township drain into tributaries of Fourmile Creek, which empties into Pelican Bay. The northern portions have no definite visible drainage. The precipitation either sinks directly into fissures in the lava or accumulates in small lakelets which may possess underground outlets.

The township contains no agricultural lands. Marshy places around the edges of Blue Canyon lakes and the lakelets in the eastern areas of the township would supply small quantities of pasturage, but the tracts are all difficult of access.

The forest is of the alpine-hemlock type throughout. Fires of modern origin have ravaged it extensively. The great burns which cover the eastern areas of the adjoining township on the west extended into the western portion of this township and wrought great havoc among what must once have been heavy stands of noble fir. The forest in the eastern areas has suffered no less, and there are scant signs of reforestation. Most of the young growth now standing is overwhelmingly composed of lodgepole pine. The bottom and eastern slopes of the South Fork Canyon have escaped fairly well and carry a forest in a state of tolerably good preservation. Much of it has not experienced a fire for 300 or 400 years, and in consequence it contains a vast amount of litter, consisting chiefly of the original lodgepole-pine growth which followed a fire that occurred between three and four centuries ago. The lodgepole pine has had time to mature, die, and fall down, and a new forest 150 years old has taken its place since that time. The soil having had time to regain its normal moisture ratio, the last forest on this tract is not lodgepole pine, but is composed of Engelmann spruce, alpine hemlock, noble fir, and alpine fir.

The mill timber throughout the township is of poor quality, besides being composed of undesirable species from a lumberman's point of view. With the exception of the southern portion of the eastern areas, the timbered tracts in the township are practically inaccessible so far as logging operations are in question, or, in other words, 90 per cent of the forested area can not be logged.

No mineral-bearing ground has been discovered in the township.

Forested and other areas in T. 35 S., R. 5 E., Oregon.

	Acres.
Forested area.....	16,640
Nonforested area (chiefly burns).....	6,400
Badly burned area.....	8,000
Logged area.....	None.

Total stand of timber in T. 35 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Noble fir.....	29.2	7,000,000	14,000,000
White fir.....			6,450,000
Alpine hemlock.....	25	6,000,000	15,000,000
Engelmann spruce.....	45.8	11,000,000	17,000,000
Total.....		24,000,000	52,450,000

Composition of forest in T. 35 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
White pine.....	Scattered trees.
Lodgepole pine.....	10
White fir.....	2
Noble fir.....	30
Alpine hemlock.....	30
Engelmann spruce.....	28

TOWNSHIP 35 SOUTH, RANGE 6 EAST.

This township is situated wholly on the eastern side of the main range of the Cascades and consists in part of the northern, eastern, and southern slopes of Lost Peak, an extinct volcanic cone situated in the western edge of the township and rising to a height of 8,000 feet above sea level, and in part in the eastern sections of marshy and swamp lands on the margins of Upper Klamath Lake. The mountainous portions of the township are uniformly rocky and barren at all of the higher elevations and throughout, at all altitudes, on the northern and western slopes of Lost Peak.

The visible water supply is in a few small springs and insignificant rivulets. The large precipitation which must fall on a mountain of the size and elevation of Lost Peak sinks in the crevices of its lava and is lost to view.

There are no agricultural lands in the township. The marshy areas in the eastern sections produce heavy growths of sedge and tule, but the lands are too wet and mucky to permit of their use for pasture or hay.

The forest consists of the three chief types common to the slopes of the Cascades in this region. The red fir and the yellow-pine types are not closely differentiated, the red and white fir components in the

first-mentioned type forming more nearly subtype aggregations in the stands of yellow-pine type. The mill timber at the lowest and middle elevations on the southern and eastern slopes of Lost Peak is of fair quality and moderately easy of access, but is generally of small dimensions. Elsewhere and at high altitudes it is of poor quality and inaccessible.

Fires have marked nearly all of the forest throughout the township. Most of the damage has been on the northern and western slopes of Lost Peak. Reforestation is scanty, most of it being composed of scattered stands of lodgepole pine. Many of the burned-over tracts are covered with dense brush growth of various species of shrubs, the vellum-leaved ceanothus being the most common and prominent species.

None of the lands are mineral in character.

The areal and timber estimates are as follows:

Forested and other areas in T. 35 S., R. 6 E., Oregon.

	Acres.
Forested area	16,740
Nonforested area (bare rocks and marsh 5,500; burned, 800)	6,300
Badly burned area	5,200
Logged area	None.

Total stand of timber in T. 35 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	44.2	25,000,000	38,000,000
Sugar pine	3.5	2,000,000	2,650,000
White pine .....	.9	500,000	500,000
Red fir	17.7	10,000,000	20,000,000
White fir	8.9	5,000,000	30,000,000
Noble fir	17.7	10,000,000	15,000,000
Alpine hemlock	7	4,000,000	6,000,000
Engelmann spruce			500,000
Total		56,500,000	112,650,000

Composition of forest in T. 35 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	20
Sugar pine .....	.8
White pine .....	.1
White-bark pine .....	.01
Red fir	30
White fir	26
Noble fir	14
Alpine hemlock	7.3
Engelmann spruce	1

TOWNSHIP 35 SOUTH, RANGE 7½ EAST.

This township is situated in Upper Klamath Lake and contains overflowed lands producing sedge and tule and lands deeply covered by the waters of the lake. It has no forested areas. In some places on the overflowed marshes semidry hummocks covered with willow brush are beginning to appear, which is evidence of a gradual lowering or drying up of the lake through natural causes.

TOWNSHIP 35 SOUTH, RANGE 7 EAST.

The western areas of this township consist of marshy and grass-covered tracts bordering Upper Klamath Lake. The eastern sections include steep ridges of volcanic origin rising abruptly from the marshy eastern areas.

The steep western front of the hilly section is sparsely timbered; the balance bears a forest of yellow pine of light stands and inferior quality. It is all fire marked.

Forested and other areas in T. 35 S., R. 7. E., Oregon.

	Acres.
Forested area	15,360
Nonforested area (marsh and meadow)	7,680
Logged area.....	None.

Total stand of timber in T. 35 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fect B. M.	Fect B. M.
Yellow pine	100	25,000,000	40,320,000

Composition of forest in T. 35 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	95
Lodgepole pine.....	5

TOWNSHIP 35 SOUTH, RANGE 8 EAST.

This township is situated east of the main range of the Cascades and consists of rough, broken ridges and slopes radiating from Swan Lake Point.

The forest is chiefly yellow pine of medium quality, fire marked throughout, and difficult of access. Small grassy swales occur and are fringed with stands of lodgepole pine.

Forested and other areas in T. 35 S., R. 8 E., Oregon.

Forested area.....	Acres. 23,040
Logged area.....	None.

Total stand of timber in T. 35 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	87	40,000,000	59,296,600
Sugar pine.....	4.3	2,000,000	2,764,800
Red fir	8.7	4,000,000	5,776,200
White fir			1,382,400
Total.....		46,000,000	69,220,000

Composition of forest in T. 35 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	90
Sugar pine.....	1
Lodgepole pine.....	6
White fir	1
Red fir.....	2

TOWNSHIP 35 SOUTH, RANGE 9 EAST.

The northern portion of this township consists of flats and low hills of rough lava. It is sparsely or not at all timbered, the forest, when present, being composed of scattered trees of yellow pine, or of thin lines of yellow pine, lodgepole pine, cottonwoods, and aspen fringing the streams. The central and southern areas consist of slopes and spurs projecting from Saddle Mountain, a volcanic peak. These ridges are well timbered along their summits and intermediate slopes, sparsely at their base. The yellow pine, which forms the principal mill timber, is mostly of small growth, rarely exceeding 24 inches at the base; 60 per cent falling below 20 inches basal diameter. It is difficult of access except at the lowest elevations and is fire marked throughout.

Forested and other areas in T. 35 S., R. 9 E., Oregon.

Forested area.....	Acres. 15,340
Nonforested area (grazing and semiarid).....	7,700
Badly burned area	1,200
Logged area.....	None.

Total stand of timber in T. 35 S., R. 9 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	92.8	65,000,000	73,000,000
Sugar pine.....	5.7	4,000,000	1,000,000
Red fir	1.5	1,000,000	4,000,000
White fir			2,000,000
Total.....		70,000,000	80,000,000

Composition of forest in T. 35 S., R. 9 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	85
Lodgepole pine.....	12
Sugar pine.....	.25
Red fir	2
White fir .....	.75

TOWNSHIP 35 SOUTH, RANGE 10 EAST.

This township consists of a semiarid lava plateau bordering and extending north of the Sprague River Valley. In the extreme northern portion of the township the plateau rises into steep, rocky hills.

The region is very sparsely timbered, the forest consisting of scattered trees of low, scraggy growth.

Forested and other areas in T. 35 S., R. 10 E., Oregon.

	<i>Acres.</i>
Forested area	12,160
Nonforested area (meadow and semiarid grazing land).....	10,880
Logged area	None.

Total stand of timber in T. 35 S., R. 10 E., Oregon.

Species.	Local practice.	Michigan practice.
	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine.....		6,000,000

Composition of forest in T. 35 S., R. 10 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	99
Lodgepole pine.....	} 1
Western juniper.....	

TOWNSHIP 35 SOUTH, RANGE 11 EAST.

This township comprises a rocky lava plateau stretching northward from the Sprague River Valley.

Light stands of yellow pine and western juniper are scattered over the plateau and along the intersecting shallow ravines.

Forested and other areas in T. 35 S., R. 11 E., Oregon.

	Acres.
Forested area.....	6,340
Nonforested area (meadow and semiarid grazing land).....	16,700
Logged area.....	None.

Total stand of timber in T. 35 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine.....			3,200,000

Composition of forest in T. 35 S., R. 11 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	99
Western juniper.....	
Cottonwood.....	
Aspen.....	1

TOWNSHIP 35 SOUTH, RANGE 12 EAST.

This township consists chiefly of a stony lava plateau stretching northward from Sprague River Valley and bordering on the west the lower reaches of the Sycan River. The northeast corner contains a hilly area coming into the township from the Black Hills.

The plateau portion of the township is nearly treeless. The hilly areas bear light stands of yellow pine of inferior quality, fire marked, and more or less difficult of access.

Forested and other areas in T. 35 S., R. 12 E., Oregon.

	Acres.
Forested area.....	4,240
Nonforested area (meadow and semiarid grazing land).....	18,800
Logged area (culled 50 per cent).....	1,000

Total stand of timber in T. 35 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine.....	100	8,000,000	17,300,000

Composition of forest in T. 35 S., R. 12 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	99
White fir.....	} 1
Western juniper.....	
Lodgepole pine.....	
Cottonwood.....	
Aspen.....	

TOWNSHIP 35 SOUTH, RANGE 13 EAST.

The northwestern areas of this township consist of southward-projecting spurs from the Black Hills Range. The central and southern portions consist of broad slopes and low ridges which are intersected by many small streams fringed with grassy, nonforested glades. In the extreme southern area is a nucleus of rocky ledges around an extinct crater.

The central and northern areas are timbered with stands of yellow pine of moderate density and of medium quality. The southern sections are very thinly forested, and the stands are separated by large grassy or sagebrush-covered flats.

The region is easy of access.

Forested and other areas in T. 35 S., R. 13 E., Oregon.

	Acres.
Forested area.....	16,940
Nonforested area (burned, 1,500; grazing, etc., 4,600).....	6,100
Badly burned area.....	2,200
Logged area.....	None.

Total stand of timber in T. 35 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine.....	88.3	40,000,000	48,000,000
Sugar pine.....	6.6	3,000,000	3,000,000
White fir.....	4.4	2,000,000	6,000,000
Incense cedar.....	.6	300,000	600,000
Total.....		45,300,000	57,600,000

Composition of forest in T. 35 S., R. 13 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	90
Sugar pine.....	.5
Lodgepole pine.....	8
White fir.....	1.4
Incense cedar.....	} .1
Western juniper.....	

TOWNSHIP 35 SOUTH, RANGE 14 EAST.

This township was estimated from information, and was not examined personally.

Forested and other areas in T. 35 S., R. 14 E., Oregon.

Forested area	Acres.	8,040
Nonforested area		15,000

Total stand of timber in T. 35 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	16,000,000	22,000,000
White fir			6,000,000
Total		16,000,000	28,000,000

TOWNSHIP 36 SOUTH, RANGE 2 WEST.

This township consists chiefly of agricultural and grazing lands bordering Rogue River and its tributary, Bear Creek.

The timber occurs along the streams and on the slopes of Table Rock, where it is scattered in thin stands among masses of brush. It is of no commercial importance.

Forested and other areas in T. 36 S., R. 2 W., Oregon.

Forested area	Acres.	4,200
Nonforested area		18,840

Total stand of timber in T. 36 S., R. 2 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine			2,300,000
Red fir			200,000
Total			2,500,000

Composition of forest in T. 36 S., R. 2 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

Yellow pine	Per cent.	30
Red fir		2
Oak		68

TOWNSHIP 36 SOUTH, RANGE 1 WEST.

The lands in this township are mostly level valley lands of the semiarid type, supporting a scant growth of grass, and utilized for agricultural purposes where water for irrigation is available.

The coniferous growth is confined to a few hilly areas in the southern sections. It has no commercial value. The region outside the cultivated areas is dotted with copses of low-growing oaks and numerous patches of the common chaparral of the region (*Ceanothus cuneatus*).

Forested and other areas in T. 36 S., R. 1 W., Oregon.

	Acres.
Forested area.....	5,000
Nonforested area.....	18,040
Logged area (culled, 90 per cent).....	All.

Total stand of timber in T. 36 S., R. 1 W., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine			2,700,000
Red fir			300,000
Total.....			3,000,000

Composition of forest in T. 36 S., R. 1 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	58
Red fir.....	2
Oak.....	40

TOWNSHIP 36 SOUTH, RANGE 1 EAST.

The township consists of low hills and level areas along Little Butte and Antelope creeks. The tracts are all of the semiarid type, and are under cultivation where irrigation is possible and practicable.

Fires have run throughout the township, and large areas of the slopes are covered with dense stands of mountain mahogany and other varieties of scrub vegetation.

The mill timber has long ago been closely culled and what is left is of little commercial value.

Forested and other areas in T. 36 S., R. 1 E., Oregon.

	Acres.
Forested area.....	9,400
Nonforested area.....	13,640
Logged area (culled, 75 per cent).....	All.

Total stand of timber in T. 36 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine			4,800,000
Red fir			500,000
Total.....			5,300,000

Composition of forest in T. 36 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	70
Red fir	5
White fir	Scattered trees.
Oak	25
Madrona	Scattered trees.

TOWNSHIP 36 SOUTH, RANGE 2 EAST.

This township comprises a hilly region, with many steep and rocky ridges draining into the tributaries of Little Butte Creek.

The forest is scanty and mostly of inferior quality, the best portions having long since been cut out.

Fires have marked it all, and have induced extensive brush growths throughout the timbered areas.

Forested and other areas in T. 36 S., R. 2 E., Oregon.

	Acres.
Forested area	16,040
Nonforested area	7,000
Logged area (culled, 30 per cent).....	10,000

Total stand of timber in T. 36 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	35.7	5,000,000	12,000,000
Sugar pine.....	7.1	1,000,000	3,000,000
Red fir	57.1	8,000,000	22,000,000
White fir			3,000,000
Incense cedar			1,000,000
Total.....		14,000,000	41,000,000

Composition of forest in T. 36 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	35
Sugar pine	1
Red fir	50
White fir	8
Incense cedar .....	.2
Oak	5.8

TOWNSHIP 36 SOUTH, RANGE 3 EAST.

This township is situated in part within the watershed of Little Butte Creek and in part within the watershed of the South Fork of Big Butte Creek. The eastern areas consist of long, easy slopes stretching westward from the base of Mount Pitt; the western portions are a mass of steep, broken ridges and slopes with broad valleys in the north-central areas of the township.

The central and, in part, the eastern areas contain a very massive forest in which the yellow pine, largely composed of standards and veterans, is of excellent quality and easy of access. A large proportion of the red fir is composed of small standards. The noble fir enters the township in the extreme eastern areas. The white pine occurs in the southeast areas. Fires have run through most of the township, burning 10 per cent of the timber. Brush growths with scanty reforestations are the results of the fires.

Forested and other areas in T. 36 S., R. 3 E., Oregon.

	Acres.
Forested area	19,440
Nonforested area (meadows, glades, etc.)	3,600
Badly burned area	1,500
Logged area	600

Total stand of timber in T. 36 S., R. 3 E., Oregon.

Species	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	22.4	35,000,000	50,000,000
Sugar pine	1.3	2,000,000	4,500,000
White pine	3.2	5,000,000	6,000,000
Red fir	64.1	100,000,000	160,000,000
White fir	3.2	5,000,000	25,000,000
Noble fir	5.2	8,000,000	10,500,000
Incense cedar .....	.6	1,000,000	2,500,000
Total		156,000,000	258,500,000



A. MOUNT PITT, FROM WEST END OF PELICAN BAY, UPPER KLAMATH LAKE.



B. MOUNT PITT, AS SEEN FROM FISH LAKE.

Composition of forest in T. 36 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent
Yellow pine	23
Sugar pine .....	.5
White pine .....	.5
Lodgepole pine.....	2
Red fir	60
White fir	10
Noble fir.....	3
Incense cedar .....	.2
Yew and cottonwood .....	.8

TOWNSHIP 36 SOUTH, RANGE 4 EAST.

This township in part is situated on the western slope of the Cascades. In part it covers the summit, while the extreme eastern sections lie on the eastern declivities of the range. The crest line of the Cascades enters the township near the northeast corner, forming a west-curving arch toward the southeast corner, where it leaves the township.

The western areas of the township consist of a series of narrow, flat terraces encircling the base of Mount Pitt. The central and eastern sections contain Mount Pitt in the northern portions and have the southern and intermediate areas filled with vast lava flows from the volcanic vents which anciently existed around this peak.

Mount Pitt, seen from any direction, appears as a huge, symmetrical, sharp-pointed cone. In reality it is a narrow hogback which originally formed the western and southern segments of the periphery of a huge crater. Most of this crater has been blown away by ancient eruptions, leaving standing the sharp-crested ridge now known as Mount Pitt. At the northwestern termination the ridge falls sharply and precipitously away, which, together with the steep slopes on all sides, give it the characteristic conical aspect. The mountain has an altitude of 9,760 feet. It stands on a nearly circular platform of lava about 6 miles in diameter. A great deal of this lava is of the most vesicular type and is indescribably rough. It has issued from fissures at the base of the mountain and is of comparatively recent formation, much of it not having the slightest soil covering, or supporting any vegetation except mosses and lichens in the crevices (Pl. LXXXIII, *A* and *B*).

The crest line of the Cascades passes directly through the mountain and continues southward to Mount Brown, being formed, in part, between the two peaks of a rough lava flow which apparently welled out from a fissure that opened southward from Mount Pitt, and, in part, from lava flows ejected northward from Mount Brown.

With the exception of a few unimportant rivulets the entire visible drainage of the township is concentrated in the North Fork of Little Butte Creek. This stream and its water supply is of some importance,

inasmuch as it is drawn upon for a large portion of the irrigation water utilized on the semiarid tracts in the region of Eagle Point and Brownsboro in the Rogue River Valley. The stream first issues from under a mass of rough, heaped-up lava which forms the crest of the Cascades between Mounts Pitt and Brown. It does not come forth as small springs, but flows out in a sheet 40 or 50 feet wide and 3 to 4 feet in depth, with a strong, steady current of ice-cold water. Immediately after issuing from under the lava it enters a sort of reservoir named Fish Lake, which in reality is only a widening of the stream. The lake is about a mile in length, one-third of a mile in width, and 4 to 5 feet in depth. The creek leaves the lake at the west end through a gap one-fourth of a mile in width, which soon narrows to 150 yards. It is cut through a mass of lava and is 50 to 60 feet in depth. Fish Lake is excellently situated for water-storage purposes.

There are no agricultural lands in the township. On the south side and at the west end Fish Lake is bordered by 200 to 250 acres of marshy meadow land, partly dry during a portion of each year, overflowed at high water, and covered with a coarse growth of tough and wiry sedge.

Cattle range through the forest, and both cattle and horses are occasionally driven to the marshy ground around the lake for summer pasture. In past years sheep were pastured at the lake, but none have been there in recent years.

All of the forest types occurring on the western slopes of the Cascades in the Rogue River Basin are represented in the township, but of the yellow-pine type there is but a small quantity. Most of the township is covered with stands of the red-fir type. The alpine-hemlock type occurs on the slopes of Mount Pitt and on the adjacent high-altitude areas. The summit of Pitt projects about 350 feet above the timber line on the southern declivities and 800 feet above the line on the northern slopes.

Forest fires have ravaged all of the timbered tracts, consuming an enormous quantity of mill timber, if one may judge from the density of a few of the surviving veteran stands on the northern side of Fish Lake, which in some localities will cut 90,000 feet B. M. per acre. Especially have the fires been severe in the timbered tracts below the Mount Pitt platform to the west of the mountain. In almost every case the burned-over areas have grown up to brush, with scant signs of reforestation. In the burns a mile or two north of Fish Lake fires of recent origin have burned out even the soil down to the rough lava foundation. This has been possible because the soil on the younger lava flows, when there is any at all, is wholly composed of decaying woody matter.

The timber is of fair quality in the southwestern and west-central areas, but elsewhere is much damaged by rot due to fire sears and

scars. It can be logged on all areas below subalpine elevations by way of the old Rancheria-Fort Klamath wagon road, which runs through the center of the next township north, and, over a road with easy gradients, which affords an outlet to the Rogue River Valley settlements.

Forested and other areas in T. 36 S., R. 4 E., Oregon.

Forested area	Acres.
Nonforested area (naturally nonforested, 4,500; burned, 2,500).....	16, 040
Logged area.....	7, 000
	None.

Total stand of timber in T. 36 S., R 4 E., Oregon.

Species.	Local practice.		Michigan prac- tice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	3.1	5, 000, 000	10, 000, 000
Sugar pine.....	1.3	2, 000, 000	2, 000, 000
White pine	3.7	6, 000, 000	8, 500, 000
Red fir	75	120, 000, 000	148, 000, 000
Noble fir	11.9	19, 000, 000	37, 000, 000
White fir	5	8, 000, 000	27, 000, 000
Alpine hemlock.....			13, 000, 000
Western hemlock			1, 500, 000
Engelmann spruce			1, 000, 000
Total.....		160, 000, 000	248, 000, 000

Composition of forest in T. 36 S., R. 4 E., Oregon, including trees of all species with diameters of 4 inches at the base and upward.

Yellow pine	Per cent.
Sugar pine.....	5
White pine .....	.25
White-bark pine	2
Lodgepole pine.....	.001
Red fir	1
White fir	60
Noble fir.....	14
Alpine fir.....	10
Alpine hemlock .....	.001
Western hemlock	7
Engelmann spruce.....	.7
	.3

TOWNSHIP 36 SOUTH, RANGE 5 EAST.

This township is situated wholly on the eastern slope of the Cascades. The western areas consist of high, rough lava flows ejected partly from Mount Pitt, partly from Mount Brown; the central por-

tions consist of glaciated lava flows with numerous depressions holding small lake and marshes, while the eastern sections are flat and marshy with intersecting low combs and ridges of volcanic rock.

The drainage of the township flows into Pelican Bay of Upper Klamath Lake through a number of small creeks heading near Mount Pitt, and mostly dry in the summer time. In the north-central regions of the township is Fourmile Lake, $2\frac{1}{2}$ miles in length by one-half or three-fourths mile in width. East and south of the lake there are a dozen or more shallow lakelets scattered about in the depressions existing in the lava sheet along the northeast foot of Mount Pitt. The paucity of visible drainage from this and the foregoing townships, and in general from the entire region of high and middle altitude in the Cascades south of township 34, is noteworthy. Evidently most of the water sinks in the lava, which must be widely fissured. It is not clear where it again comes to the surface. Possibly the large and numerous springs rising in the bottom of Pelican Bay in Upper Klamath Lake account for some, but most of it is lost, or at least does not come to the surface anywhere in the immediate region of the Cascades.

There are no agricultural lands in the township. Nearly all of the creeks in the central and eastern portions are bordered by marshy sedge meadows which could be utilized for pasturage.

The forest is chiefly of the red-fir type. Areas near Mount Pitt carry stands of alpine-hemlock type and tracts in the eastern sections contain small quantities of yellow-pine type.

Forest fires have ravaged the township everywhere. Recurrent fires in the central and eastern areas have laid waste large tracts of lodgepole-pine reforestations after earlier fires. In the western portions heavy stands of veteran noble fir have been destroyed, leaving behind only lone trees here and there. The reforestations have been confined mostly to low-lying areas with plenty of seepage and soil moisture. On the slopes, brush growths have replaced the forest in almost every instance. Altogether 40 per cent of the standing timber has been destroyed by fire within the last forty or forty-five years, and at least 50 per cent of the ensuing reforestations of lodgepole pine. The old military road between Fort Klamath and the Rogue River Valley passed through the center of the township in an east-west direction. The travel over this road was, doubtless, responsible for many of the devastating fires which have demolished its forests.

The quality of the timber is poor, owing to the frequent fires. The white pine occurs chiefly in the south-central portions of the township. It is of small growth, seldom exceeding 20 inches basal diameter and 30 feet clear trunk. The township can be logged from the Pelican Bay region, but none of its areas are readily accessible.

No mineral deposits are known to occur in the township.

Forested and other areas in T. 35 S., R. 5 E., Oregon.

	Acres.
Forested area	12,840
Nonforested area (meadows, etc., 5,000, burned clean, 5,200)	10,200
Badly burned area	12,000
Logged area	None.

Total stand of timber in T. 36 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	5.3	3,000,000	3,000,000
White pine	14.	8,000,000	12,000,000
Red fir	35.	20,000,000	36,000,000
White fir	17.6	10,000,000	60,700,000
Noble fir	17.6	10,000,000	13,000,000
Alpine hemlock	8.8	5,000,000	10,000,000
Western hemlock			2,000,000
Engelmann spruce	1.7	1,000,000	3,000,000
Total		57,000,000	139,700,000

Composition of forest in T. 36 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	2
White pine	8
Lodgepole pine	8
Red fir	20
White fir	45
Noble fir	10
Alpine hemlock	5
Western hemlock	1
Engelmann spruce	1

TOWNSHIP 36 SOUTH, RANGE 6 EAST.

This township is situated wholly east of the Cascades, and comprises in the western and southern areas low rocky terminations of the volcanic mountain masses of the adjacent townships on the south and west. The central portions consist of low marshy flats, extending eastward and connecting with marshy tracts bordering Pelican Bay, which, together with a small portion of the bay, cover the eastern sections of the township.

Almost the entire visible water supply flows into Fourmile Creek, through which it finds its way into Pelican Bay. Exception should be made in the case of the large and numerous springs which rise in the bottom of that bay, and whose origin undoubtedly is in the mountains in the western portion of the township. The volume of

water in Fourmile Creek is small until about 2 miles above its outlet, where it is suddenly augmented.

The lands which can be utilized for purposes of agriculture comprise 2,000 acres; the grazing lands about 2,000 more. The tracts of grazing and agricultural lands are situated along Fourmile Creek, in the central areas of the township, extending westward about 3 miles from the marshy areas bordering Pelican Bay, and in the southeastern sections of the township bordering the bay. With few exceptions they are wet and liable to overflow, but are capable of yielding large quantities of coarse wild hay. The marshy areas bordering Pelican Bay are very wet and muddy, and can be pastured only in late summer and fall. Almost all of the grazing and agricultural land is held by residents or nonresident private owners. Some of the land here classed as agricultural is covered with half-burned growths of lodgepole pine, requiring clearing. The grazing lands are naturally non-forested, and must so remain, owing to their wet and swampy nature. Lying directly in the track of the draftage from the permanently snow-covered northeastern slopes of Pitt, the region is frosty, or at least liable to summer frosts. It is doubtless for this reason that no agricultural improvements of much value or permanency have been made.

The forest is wholly of yellow-pine type. Fires have ravaged it in all directions, and have been followed by lodgepole-pine reforestations on low-lying areas, and by brush growths on the higher and drier. The best timber is found on the southern slopes of Lost Peak, in the north-central areas of the township, along the bottoms of Fourmile Creek, on tracts elevated sufficiently to be permanently above high water, where occur heavy and very valuable stands of nearly pure growth yellow pine, and in the southeastern sections of the township, where the forest is thickest, but the timber of inferior quality.

The township can easily be logged from Pelican Bay. The logging so far done consists of cuttings to supply local demands of settlers, and has been carried on for many years. The cutting in the extreme southeast corner of the township has been for export to the mills at the foot of Upper Klamath Lake.

No mineral-bearing areas have been discovered in the township.

Forested and other areas in T. 36 S., R. 6 E., Oregon.

	Acres.
Forested area	15,840
Nonforested area (meadows, marsh, etc.)	7,200
Badly burned	5,500
Logged area (98 per cent then burned over).....	2,000

Total stand of timber in T. 36 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fect B. M.	Fect B. M.
Yellow pine	73.7	95,000,000	110,000,000
Sugar pine.....	6.2	8,000,000	8,300,000
Red fir	19.3	25,000,000	35,000,000
White fir			20,000,000
Incense cedar.....	.8	1,000,000	2,100,000
Total		129,000,000	175,400,000

Composition of forest in T. 36 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	40
Sugar pine	1
Lodgepole pine.....	20
Red fir.....	20
White fir	18
Incense cedar	1

TOWNSHIP 36 SOUTH, RANGE 7A EAST.

This township comprises areas mostly covered by the waters of Upper Klamath Lake.

A few of the points projecting into the lake bear a light forest of little or no commercial value.

Forested and other areas in T. 36 S., R. 7a E., Oregon.

	Acres.
Forested area.....	3,000
Nonforested area (marshes and lake).....	20,040
Logged area.....	None.

Total stand of timber in T. 36 S., R. 7a E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Fect B. M.	Fect B. M.
Yellow pine			2,500,000
Red fir			500,000
Total			3,000,000

Composition of forest in T. 36 S., R. 7a E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	80
Lodgepole pine	10
Red fir.....	10

TOWNSHIP 36 SOUTH, RANGE 7B EAST.

This township is mostly covered by the waters of Upper Klamath Lake, or comprises lands intermittently overflowed from that source.

The northeastern portions of the township are formed by a projecting point of the lava plateau which stretches northward from Swan Lake Point. The front of this plateau, where it breaks off to the lake, is of semiarid character, and is either bare or in spots covered with clumps of mountain mahogany or scrubby western juniper. The summit bears thin stands of yellow pine of inferior quality, mixed with small quantities of red fir and western juniper.

Forested and other areas in T. 36 S., R. 7b E., Oregon.

	Acres.
Forested area	7,280
Nonforested area	15,760
Logged area	None.

Total stand of timber in T. 36 S., R. 7b E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	15,000,000	21,640,000

TOWNSHIP 36 SOUTH, RANGE 8 EAST.

This township consists of a mass of broken ridges and spurs radiating from Swan Lake Point.

The ridges are timbered with a forest of yellow pine, most of which is of small dimensions and difficult of access. Grassy glades occur here and there among the ridges and are fringed with thin stands of lodgepole pine.

Forested and other areas in T. 36 S., R. 8 E., Oregon.

	Acres.
Forested area	23,040
Logged area	None.

Total stand of timber in T. 36 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	92.3	36,000,000	72,000,000
Sugar pine	2.6	1,000,000	2,000,000
Red fir	5.1	2,000,000	4,000,000
White fir			5,000,000
Incense cedar			1,280,000
Total		39,000,000	84,280,000

Composition of forest in T. 36 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	83
Sugar pine .....	.2
Lodgepole pine.....	12
Red fir	1
White fir	3
Incense cedar	} .8
Western juniper	

TOWNSHIP 36 SOUTH, RANGE 9 EAST.

This township consists chiefly of steep slopes extending in an east-erly direction from Swan Lake Point.

The region is well timbered except in the northeast corner of the township, where the stands are thin and are much broken by grassy glades. The timber is of medium quality, the yellow pine being largely composed of standards. It is fire marked throughout.

Forested and other areas in T. 36 S., R. 9 E., Oregon.

	Acres.
Forested area	21,840
Nonforested area	1,300
Badly burned area.....	3,300
Logged area.....	None.

Total stand of timber in T. 36 S., R. 9 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	88	95,000,000	110,500,000
Sugar pine.....	.9	1,000,000	1,300,000
Red fir.....	7.3	8,000,000	12,200,000
White fir.....	1.9	2,000,000	9,500,000
Incense cedar.....	1.9	2,000,000	2,500,000
Total.....		108,000,000	136,000,000

Composition of forest in T. 36 S., R. 9 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	88
Sugar pine .....	.3
Lodgepole pine.....	4.7
Red fir	3
White fir	} 4
Incense cedar	

TOWNSHIP 36 SOUTH, RANGE 10 EAST.

The northern sections of this township consist of bottom lands, mostly grass covered, bordering Sprague River, with small areas of steep lava bluffs north of the stream. The central and southern portions are hilly, and bear an open growth of yellow pine of small dimensions, mixed with small quantities of white fir and incense cedar along the higher elevations. The timbered areas are intersected by deforested tracts, which consist, in part, of grassy glades, wet in the spring-time, dry during the balance of the year; in part, of stony tracts, with scattered junipers or growths of sagebrush.

The logging and culling has been done by the Klamath Indians.

Forested and other areas in T. 36 S., R. 10 E., Oregon.

	Acres.
Forested area	10, 240
Nonforested area	12, 800
Logged area (culled, 2 per cent)	Throughout.

Total stand of timber in T. 36 S., R. 10 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	30, 000, 000	38, 000, 000
White fir			2, 000, 000
Incense cedar			500, 000
Total		30, 000, 000	40, 500, 000

Composition of forest in T. 36 S., R. 10 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	99
Lodgepole pine	} 1
White fir	
Incense cedar	

TOWNSHIP 36 SOUTH, RANGE 11 EAST.

This township consists chiefly of agricultural and grazing areas bordering Sprague River. The southern portion of the township comprises a hilly area, which, in part, forms the divide between the Sprague River and the Lost River drainage. The lower slopes of this divide bear an open growth of yellow pine of fair quality, mixed with thin stands of western juniper. The higher and intermediate slopes bear a denser growth of yellow pine, mixed with a small percentage of white fir and incense cedar.

These stands of timber supply the Indians around the Yainax sub-agency with their timber and lumber.

Forested and other areas in T. 36 S., R. 11 E., Oregon.

	Acres.
Forested area	7,680
Nonforested area	15,360
Logged area (culled on an average 10 per cent)	4,500

Total stand of timber in T. 36 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	58,000,000	64,000,000
White fir			2,200,000
Incense cedar			300,000
Total		58,000,000	66,500,000

Composition of forest in T. 36 S., R. 11 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	99
White fir	
Incense cedar	
Western juniper	1

TOWNSHIP 36 SOUTH, RANGE 12 EAST.

The northern areas of this township consist of grazing and agricultural lands bordering Sprague River. The central and most of the southern areas comprise a rocky lava plateau, carrying light and scattering stands of yellow pine and western juniper. In the extreme southern portions are a few slopes belonging to the Sprague River-Lost River divide, which carry stands of yellow pine of medium density and quality.

Forested and other areas in T. 36 S., R. 12 E., Oregon.

	Acres.
Forested area	2,500
Nonforested area (grass or semiarid tracts)	20,540
Logged area	None.

Total stand of timber in T. 36 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine			2,500,000
White fir			300,000
Total			2,800,000

Composition of forest in T. 36 S., R. 12 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

Yellow pine.....	99
White fir.....	} 1
Incense cedar.....	
Western juniper.....	

TOWNSHIP 36 SOUTH, RANGE 13 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 36 S., R. 13 E., Oregon.

Forested area.....	Acres. 16,040
Nonforested area.....	7,000
Logged area.....	None.

Total stand of timber in T. 36 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	100,000,000	113,000,000

TOWNSHIP 36 SOUTH, RANGE 14 EAST.

This township was not personally examined, but estimated from information.

Forested and other areas in T. 36 S., R. 14 E., Oregon.

Forested area.....	Acres. 8,040
Nonforested area.....	15,000

Total stand of timber in T. 36 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	100	5,000,000	8,000,000

TOWNSHIP 37 SOUTH, RANGE 2 WEST.

This township comprises chiefly farming land in the Rogue River Valley. The timbered portions are confined to a low hilly region in the western sections. The timber is small and worthless for mill purposes.

Forested and other areas in T. 37 S., R. 2 W., Oregon.

Forested area.....	Acres. 2,400
Nonforested area.....	20,640
Logged area.....	All.

Total stand of timber in T. 37 S., R. 2 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine			800,000
Red fir			400,000
Total.....			1,200,000

Composition of forest in T. 37 S., R. 2 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	65
Red fir	30
White fir, incense cedar, oak, etc.....	5

TOWNSHIP 37 SOUTH, RANGE 1 WEST.

The western and central portions of this township comprise agricultural and grazing lands of various character. The agricultural lands are in Bear Creek Valley and grazing lands on the slopes of Grizzly Range. These lands carry in some places oak copses and scattered trees of yellow pine.

The summit of the range and the eastern slope are timbered with light stands of yellow pine and red fir, mostly of small growth. The forest is much intersected with grassy glades, all badly overpastured.

Forested and other areas in T. 37 S., R. 1 W., Oregon.

	<i>Acres.</i>
Forested area	9,540
Nonforested area (meadows, agricultural, and rocky glades)	13,500
Logged area.....	3,600

Total stand of timber in T. 37 S., R. 1 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	37.5	6,000,000	9,000,000
Sugar pine.....			1,000,000
Red fir	62.5	10,000,000	15,000,000
White fir			5,000,000
Incense cedar			400,000
Total.....		16,000,000	30,400,000

Composition of forest in T. 37 S., R. 1 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	32
Sugar pine.....	Scattered trees.
Red fir.....	50
White fir.....	14
Oak.....	4
Incense cedar.....	Scattered trees.

TOWNSHIP 37 SOUTH, RANGE 1 EAST.

This township consists of eastern slopes of the Grizzly Range and a broken and hilly region forming portions of Antelope and Little Butte creeks watershed.

The forest is much scattered, forming thin stands surrounded with broad strips of brush growth throughout the township. It is of small growth and mostly of inferior quality.

Forested and other areas in T. 37 S., R. 1 E., Oregon.

	Acres.
Forested area.....	21,140
Nonforested area (glades, etc.).....	1,900
Badly burned area.....	2,300
Logged area.....	Throughout to the extent of 35 per cent.

Total stand of timber in T. 37 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine.....	62.5	10,000,000	18,000,000
Sugar pine.....			500,000
Red fir.....	37.5	6,000,000	12,000,000
White fir.....			1,500,000
Total.....		16,000,000	32,000,000

Composition of forest in T. 37 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	35
Sugar pine.....	Scattered trees.
Red fir.....	50
White fir.....	5
Oak.....	10

TOWNSHIP 37 SOUTH, RANGE 2 EAST.

This township comprises a much broken region in the watershed of Little Butte Creek. The northern areas are lightly timbered; the southern bear good stands of forest. Red fir of small growth is the principal component.

Forested and other areas in T. 37 S., R. 2 E., Oregon.

	Acres.
Forested area	20,040
Nonforested area (naturally nonforested)	3,000
Badly burned area	2,600
Logged area	800

Total stand of timber in T. 37 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	28.5	20,000,000	35,000,000
Sugar pine			1,700,000
Red fir	71.5	50,000,000	60,000,000
White fir			4,000,000
Total		70,000,000	100,700,000

Composition of forest in T. 37 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	35
Sugar pine	2
Red fir	58
White fir	5

TOWNSHIP 37 SOUTH, RANGE 3 EAST.

The township consists chiefly of steep, rocky areas at the headwaters of Little Butte Creek. The forest is of medium density, and is intersected by great numbers of small rocky glades.

Forested and other areas in T. 37 S., R. 3 E., Oregon.

	Acres.
Forested area	19,540
Nonforested area (rocky glades and agricultural)	3,500
Badly burned area	800
Logged area (culled 25 per cent)	1,500

Total stand of timber in T. 37 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	27	38,000,000	54,000,000
Sugar pine	3.5	5,000,000	5,600,000
Red fir	68	95,000,000	130,000,000
White fir	1.4	2,000,000	4,000,000
Total		140,000,000	193,600,000

Composition of forest in T. 37 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	35
Sugar pine	3
Red fir	56
White fir	5
Incense cedar	} 1
Pacific yew	

TOWNSHIP 37 SOUTH, RANGE 4 EAST.

This township forms the southwest corner of the reserve and is situated wholly on the western declivities of the Cascades. It consists of rough and rocky areas, the eastern sections covered with lava flows from an extinct cone in the township to the east, locally known as Mount Brown. Most of these lava flows are of comparatively recent origin, so much so that no soil has as yet covered them.

The forest is of red-fir type, light and irregular in the eastern half of the township, but comprising some exceedingly heavy stands in the western areas.

The township contains no agricultural lands, but along North Fork of Little Butte Creek, which drains the western half of the township, are narrow swales of grazing lands, marshy or merely wet during stages of low water, submerged during flood seasons. Cattle range throughout the township, and considerable tracts of forest have been burned within recent years, apparently to provide browse for the stock. There are no signs to indicate that sheep have been pastured in the township in recent years.

In the aggregate there are only 1,000 or 1,500 acres in the township not touched by fires of modern origin. These tracts exist as small, detached spots, everywhere surrounded by a network of fire lanes, where the destruction varies from 10 per cent to total.

The density of the forest varies much. On the lava flows from Mount Brown it is less than 2,000 feet B. M. per acre. In the western sections of the township the best stands average 17,000 feet B. M. per acre, while small areas here and there in the same sections run as high as 80,000 feet B. M. per acre.

With the exception of the lava tracts in the eastern portions of the township, which are wholly inaccessible, the timbered areas can be logged from the south by way of the Ashland-Pelican Bay wagon road.

No mineral deposits are known to exist in the township.

Forested and other areas in T. 37 S., R. 4 E., Oregon.

	Acres.
Forested area	18,940
Nonforested area (bare rocks, meadows, glades, etc., 3,100; burned clean 1,000)	4,100
Badly burned area	4,500
Logged area	None.

Total stand of timber in T. 37 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
White pine	8.2	13,000,000	18,000,000
Red fir	69.2	110,000,000	180,000,000
White fir	12.5	20,000,000	48,500,000
Noble fir	9.4	15,000,000	26,000,000
Engelmann spruce .....	.6	1,000,000	3,500,000
Yellow pine			940,000
Total		159,000,000	276,940,000

Composition of forest in T. 37 S., R. 4 E., Oregon, including trees of all species with diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine .....	.2
White pine	6.
Sugar pine	Scattered trees.
Lodgepole pine .....	.8
Red fir	64.
White fir	18.
Noble fir	10.
Engelmann spruce .....	.8

TOWNSHIP 37 SOUTH, RANGE 5 EAST.

The western portion of this township consists of the crest-line areas of the main range of the Cascades; the central of a depression stretching from north to south with a width of 2 to 3 miles, and the eastern of the western slopes of a high, rugged, volcanic mountain mass lying between the Cascades and Upper Klamath Lake.

In the northwest corner of the township the crest of the Cascades is formed of an extinct volcanic cone locally known as Mount Brown. Lines of comparatively recent lava flows ejected from this vent constitute the crest for some miles south from this cone. Near the southwest corner of the township the lava flows come to an end and the summit of the range is a flat or gently rolling area 2 to 2½ miles in width.

Most of the central depression in the township is covered with the waters of Lake of the Woods. This is a shallow sheet of water, 3 miles long, about a mile in width at its widest portion. Its western shore line, formed by lava flows from Mount Brown, rises rocky and abrupt; its eastern shores are marshy for a short distance back from the lake, then rise gently toward the east in a succession of terraces.

Considering that the township lies within a region of comparatively heavy precipitation, its visible run-off is remarkably small. Evidently

most of the water sinks in the much-fissured lava to reappear somewhere outside the township boundaries. The Lake of the Woods, which forms a sort of reservoir for the entire visible drainage of the township, empties into Upper Klamath Lake through an insignificant creek, which is dry throughout most of the year. It is not unlikely that the lake has an underground outlet.

The township contains no agricultural lands. The northern and the southern ends of Lake of the Woods terminate in marshes containing in the aggregate about 1,200 acres. They produce heavy growths of coarse marsh sedges and species of rush, and are covered with water to a depth of 2 to 4 feet during portions of the year.

The forest is chiefly of the red-fir type. It contains a small percentage of yellow pine, which species here crosses the Cascades, one line coming north from the yellow-pine areas in the Klamath Gap, another coming from the southwest through low gaps in the crest line of the range from the headwaters of Jenny and Dead Indian creeks. The red and white firs also cross the range in this township.

Fires have ravaged the entire township. With the exception of the thinly forested lava flows on the slopes of Mount Brown, I did not see a patch of forest as large as 20 acres which did not show the marks of fire within the past forty years. In many localities the fires have made a clean sweep of the timber, and the areas have grown up to brush; in other places they have been of low intensity, burning 40 per cent of a stand here, 5 per cent there, or merely destroying individual trees, but consuming the humus and killing the undergrowth. The areas to the west and at the south end of Lake of the Woods have been exceptionally badly damaged by recent fires. The entire township seems to have been peculiarly exposed to destructive forest fires for ages. Most of its forest consists of reforestations less than 120 years of age, which in some places contain scattered trees of veteran red fir 400 or more years old. One of the noteworthy features of the reforestations is the very large quantity of white fir in their composition.

Most of the timber in the township can be logged from the eastern side of the range via the Ashland-Pelican Bay wagon road. The areas around Mount Brown are inaccessible, so far as logging operations are in question. The timber is generally of inferior quality throughout, having been too often exposed to forest fires.

No mineral deposits are known to occur in the township.

Forested and other areas in T. 37 S., R. 5 E., Oregon.

	Acres.
Forested area	16,640
Nonforested area (lakes and marshes, 4,000; burned clean, 2,400)	6,400
Badly burned area	7,000
Logged area	None.

Total stand of timber in T. 37 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	3.9	2,000,000	2,000,000
White pine	11.6	6,000,000	12,000,000
Red fir	39.	20,000,000	30,000,000
White fir	19.4	10,000,000	120,000,000
Noble fir	23.2	12,000,000	16,000,000
Alpine hemlock.....	2.9	1,500,000	3,000,000
Western hemlock.....			2,500,000
Engelmann spruce.....			400,000
Total		51,500,000	185,900,000

Composition of forest in T. 37 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	1
White pine	5
Lodgepole pine	3
Red fir	15
Noble fir	8
White fir	64
Engelmann spruce.....	Scattered trees.
Alpine hemlock.....	2
Western hemlock.....	2

TOWNSHIP 37 SOUTH, RANGE 6 EAST.

This township constitutes the southwest corner of the reserve and is situated east of the main range of the Cascades. Almost the entire township is filled with the mass of a high, craggy mountain range of volcanic origin, connecting with the Cascades through a level plateau area in the northern portion of T. 38 S., R. 5 E.

The township has no agricultural or grazing lands. There are small grassy glades scattered throughout the mountain areas, but they are practically inaccessible.

The forest is a mixture of yellow-pine, red-fir, and alpine-hemlock types. On the eastern and northern slopes there are small tracts at the lowest elevations carrying stands of forest in which yellow pine predominates. At higher elevations occurs the red-fir type, while the great body of the mountain mass bears only stands of alpine-hemlock type of low, scraggy growth scattered among rocky peaks and canyons or on lava slopes where large, bare areas separate the thin lines and groups of trees.

Fires have run throughout the entire township, consuming 25 per cent of the timber and badly damaging the remainder. Brush growths

composed chiefly of the vellum-leaved ceanothus (*Ceanothus velutinus*) have covered the burned areas in place of reforestations. The south-eastern sections especially have suffered severely.

Most of the drainage of the township sinks through the fissured lava rocks and is lost. The superficial flow is small and inconsequential.

Small portions of the northern and eastern areas can be logged from the levels bordering Upper Klamath Lake, but the forest in the larger portion of the township can not be reached.

Forested and other areas in T. 37 S., R. 6 E., Oregon.

	Acres.
Forested area	14, 040
Nonforested area (bare rocks, etc., 5, 000; burned clean, 4, 000)	9, 000
Badly burned area	6, 000
Logged area	None.

Total stand of timber in T. 37 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	12.6	7, 000, 000	11, 000, 000
Sugar pine	1.8	1, 000, 000	1, 000, 000
White pine .....	.9	500, 000	800, 000
Red fir	7.2	4, 000, 000	4, 000, 000
White fir	18	10, 000, 000	40, 000, 000
Noble fir	39.9	22, 000, 000	33, 000, 000
Alpine hemlock	14.4	8, 000, 000	15, 000, 000
Engelmann spruce	5.4	3, 000, 000	6, 000, 000
Total		55, 500, 000	110, 800, 000

Composition of forest in T. 37 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	10
Sugar pine .....	.6
White pine .....	.9
Lodgepole pine	22
Red fir	3
White fir	20
Noble fir	18
Alpine hemlock	20
Engelmann spruce	5

TOWNSHIP 37 SOUTH, RANGE 7 EAST.

The eastern areas of this township comprise a broken lava slope, with ridges of low elevation rising here and there, bordering the western shore of Upper Klamath Lake. The central areas comprise a portion of Aspen Lake, with various marshy tracts adjoining, while the western sections rise into a range of high and steep mountains.

The areas fronting on Upper Klamath Lake are thinly forested with scattered trees of yellow pine, lodgepole pine, and white fir. The western and the higher ground of the central areas bear much excellent yellow pine, standards and veterans, with good, clear body.

The forest is everywhere in the township badly fire marked, and in the western areas are many tracts where 50 per cent of the standing timber is dead from this cause.

Forested and other areas in T. 37 S., R. 7 E., Oregon.

	Acres.
Forested area	19,140
Nonforested area (marsh and lake)	3,900
Badly burned area	5,300
Logged area (culled 10 per cent)	1,000

Total stand of timber in T. 37 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	91.7	110,000,000	135,800,000
Red fir	5	6,000,000	10,000,000
White fir	3.3	4,000,000	24,000,000
Total		120,000,000	169,800,000

Composition of forest in T. 37 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	75
Lodgepole pine	5
Red fir	2
White fir	18
Western juniper	Scattered trees.

TOWNSHIP 37 SOUTH, RANGE 8 EAST.

This township lies mostly in Upper Klamath Lake, only an inconsiderable area in the western portion carrying thin stands of yellow pine.

Forested and other areas in T. 37 S., R. 8 E., Oregon.

	Acres.
Forested area	700
Nonforested area (marsh and lake)	22,700

Total stand of timber in T. 37 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine			1,400,000

TOWNSHIP 37 SOUTH, RANGE 9 EAST.

The eastern areas of this township consist of marshy grass, or drier agricultural lands forming the western portion of Swan Lake Valley. The western sections comprise rough semiarid hills; the eastern sides are sparsely timbered with small-growth yellow pine; the western are bare or with scattered trees; the intervening valleys are mostly covered with sage or with rabbit brush where water for irrigation is not available.

Forested and other areas in T. 37 S., R. 9 E., Oregon.

	Acres.
Forested area.....	10,880
Nonforested area (brush-covered semiarid tracts, meadows, etc.)	12,160
Logged area.....	None.

Total stand of timber in T. 37 S., R. 9 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	20,000,000	40,320,000

Composition of forest in T. 37 S., R. 9 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	99
Other species	1

TOWNSHIP 37 SOUTH, RANGE 10 EAST.

The central, western, and southern areas of this township consist of grazing and agricultural lands in Swan Lake Valley, which is a flat, dried-up lake bottom bounded on the east by a remarkably steep and precipitous, very thinly-forested mass of lava. The northern and western sides of the valley are inclosed by broken ridges and slopes, while the southern end connects with the treeless areas of Alkali Flat. The northeastern portions of the township consist of the terraced eastern slope of Swan Lake Point and bear the forest. This is chiefly composed of scattered stands of medium quality yellow pine mixed with considerable quantities of small-growth red fir and incense cedar. The tract has been culled over for years, and most of the more valuable incense cedar has been cut away and removed. Fires have run throughout, and the forest is in consequence much broken by brushed-over fire glades.

Forested and other areas in T. 37 S., R. 10 E., Oregon.

	Acres.
Forested area.....	6,880
Nonforested area (meadow and agricultural lands)	16,160
Badly burned area	800
Logged area (culled 35 per cent)	3,800

Total stand of timber in T. 37 S., R. 10 E., Oregon.

Species.	Local practice		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	83.2	25,000,000	32,000,000
Sugar pine			400,000
Red fir	16.8	5,000,000	5,000,000
White fir			5,000,000
Incense cedar			700,000
Total		30,000,000	43,100,000

Composition of forest in T. 37 S., R. 10 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	88
Sugar pine .....	.2
Lodgepole pine .....	.8
Red fir	6
White fir	3
Incense cedar	1
Western juniper	1

TOWNSHIP 37 SOUTH, RANGE 11½ EAST.

The central and southern areas of this township consist of semiarid lands with scattered poplar groves around the springs, or with thin stands of western juniper, or covered with bowlders and naked masses of rock and wholly nonforested. The northwestern and northeastern portions carry thin stands of inferior quality yellow pine. The timber is easy of access, but of little commercial value.

Forested and other areas in T. 37 S., R. 11½ E., Oregon.

	<i>Acres.</i>
Forested area	8,320
Nonforested area (bare rocks, semiarid tracts, grazing and agricultural)	14,720
Logged area	None.

Total stand of timber in T. 37 S., R. 11½ E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	100	12,000,000	18,500,000

Composition of forest in T. 37 S., R. 11½ E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	93
Lodgepole pine	1
Western juniper	1
Poplar	1

TOWNSHIP 37 SOUTH, RANGE 11 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 37 S., R. 11 E., Oregon.

Forested area	Acres. 19,200
Nonforested area	3,840

Total stand of timber in T. 37 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	40,000,000	57,600,000

TOWNSHIP 37 SOUTH, RANGE 12 EAST.

This township was not examined personally, but was estimated from information.

Forested and other areas in T. 37 S., R. 12 E., Oregon.

Forested area	Acres. 20,140
Nonforested area	2,900

Total stand of timber in T. 37 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	65,000,000	94,000,000
White fir			6,000,000
Total	100	65,000,000	100,000,000

TOWNSHIP 37 SOUTH, RANGE 13 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 37 S., R. 13 E., Oregon.

Forested area	Acres. 20,440
Nonforested area	2,600

Total stand of timber in T. 37 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	60,000,000	95,000,000

TOWNSHIP 37 SOUTH, RANGE 14 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 37 S., R. 14 E., Oregon.

	Acres.
Forested area	17, 040
Nonforested area	6, 000

Total stand of timber in T. 37 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	94	30, 000, 000	42, 000, 000
White fir	6	2, 000, 000	10, 000, 000
Total		32, 000, 000	52, 000, 000

TOWNSHIP 38 SOUTH, RANGE 2 WEST.

This township covers a region of low but steep hills west of Bear Creek Valley. The valuable timber on these tracts has long ago been cut or burned, leaving nothing but a trace of the forest.

Forested and other areas in T. 38 S., R. 2 W., Oregon.

	Acres.
Forested area	17, 840
Nonforested area	5, 200
Badly burned area	6, 500
Logged area (60 per cent)	Throughout.

Total stand of timber in T. 38 S., R. 2 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	12, 000, 000	30, 000, 000

Composition of forest in T. 38 S., R. 2 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	70
Red fir	28
Oak, madroña	2

TOWNSHIP 38 SOUTH, RANGE 1 WEST.

This township consists of grazing and agricultural lands in Bear Creek Valley. The tree growth is composed of orchard stands and of thin fringes of willows, cottonwoods, Oregon ash, and maple along the banks of the stream.

Forested and other areas in T. 38 S., R. 1 W., Oregon.

	Acres.
Forested area	None.
Nonforested area	23, 040

TOWNSHIP 38 SOUTH, RANGE 1 EAST.

The western and central areas of this township are situated in Bear Creek Valley and consist of grazing and agricultural lands. The eastern portions comprise slopes of Grizzly Range. The western declivities of the range are very sparsely timbered with scattered groups of yellow pine. The summit and eastern slopes bear light stands of yellow pine and red fir of small growth.

Forested and other areas in T. 38 S., R. 1 E., Oregon.

	Acres.
Forested area	11, 440
Nonforested area (grazing and agricultural)	11, 600
Logged area (culled, 65 per cent)	4, 600

Total stand of timber in T. 38 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	10, 000, 000	22, 000, 000
Red fir			1, 600, 000
Total		10, 000, 000	23, 600, 000

Composition of forest in T. 38 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent
Yellow pine	98
Red fir	1
Oak	1

TOWNSHIP 38 SOUTH, RANGE 2 EAST.

The western portion of this township comprises Grizzly Peak and radiating ridges, rocky and lightly timbered with small red fir, noble fir, and white fir, badly burned throughout.

The central and eastern areas consist of steep escarpments, rising

abruptly to the upper plateau of the Cascades, and bear scattered stands of small-growth mill timber, culled of its best portions, in the neighborhood of the various settlements east of Grizzly Range.

Forested and other areas in T. 38 S., R. 2 E., Oregon.

	Acres
Forested area	12,040
Nonforested area (burned, 3,000; glades, etc., 8,000).....	11,000
Badly burned area.....	5,800
Logged area (culled 40 per cent).....	6,000

Total stand of timber in T. 38 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	25	5,000,000	11,000,000
Red fir	75	15,000,000	33,000,000
White fir.....			3,000,000
Noble fir			1,000,000
Total.....		20,000,000	48,000,000

Composition of forest in T. 38 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	20
Sugar pine .....	.1
Red fir	70
White fir.....	6
Noble fir.....	.9
Oak, mountain mahogany	3

TOWNSHIP 38 SOUTH, RANGE 3 EAST.

The central sections of this township consist of a series of open, grassy glades, used for grazing and agriculture. The northern and southern areas comprise low ranges of hills bearing excellent stands of yellow pine and red fir.

Fires have ravaged much of the timbered sections, destroying 25 per cent of the timber. The burned tracts do not reforest readily, but instead become covered with dense brush growths. Here, as everywhere else in the region lying on the western plateau of the Cascades, cattle range through the forest. Every glade or grass patch is badly overgrazed, and the trampling by stock when the ground is wet in spring or autumn prevents the small glades from becoming forested, as they would otherwise do, in most cases.

FOREST RESERVES.

Forested and other areas in T. 38 S., R. 3 E., Oregon.

	Acres.
Forested area	17,340
Nonforested area (meadows and glades)	5,700
Badly burned area	5,800
Logged area (culled, 75 per cent)	2,000

Total stand of timber in T. 38 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	33.3	42,000,000	55,000,000
Sugar pine	2.4	3,000,000	3,000,000
Red fir	63.5	80,000,000	92,000,000
White fir			4,880,000
Incense cedar .....	.8	1,000,000	2,000,000
Total		126,000,000	156,880,000

Composition of forest in T. 38 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	40
Sugar pine .....	.6
Red fir	55
White fir	3.7
Incense cedar .....	.1
Pacific yew .....	.1

TOWNSHIP 38 SOUTH, RANGE 4 EAST.

The southeastern portions of this township comprise a series of high, steep ridges forming the crest of the main range of the Cascades. The balance of the township consists of a plateau-like tract intersected by low ridges and numerous small grassy glades. The forest stands are extremely uneven. In the southern and central areas occur large burned-over tracts covered with brush and alternating with stands of small-growth white fir. In the northeastern corner is a low, swampy tract bearing a forest stand of massive proportion composed of white, red, and noble fir. The trees here are often as much as 8 feet in diameter and 200 feet in height. The yellow pine is of good quality and size. Most of the timber is easy of access from the west.

Forested and other areas in T. 38 S., R. 4 E., Oregon.

	Acres.
Forested area	17,340
Nonforested area (burned, 2,800; glades, etc., 2,900)	5,700
Badly burned area	7,000
Logged area	None.

Total stand of timber in T. 38 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	19	38,000,000	44,000,000
Sugar pine.....	3.5	7,000,000	8,000,000
White pine	2.5	5,000,000	5,900,000
Red fir	60	120,000,000	145,000,000
White fir.....	5	10,000,000	20,000,000
Noble fir	10	20,000,000	25,000,000
Total.....		200,000,000	247,900,000

Composition of forest in T. 38 S., R. 4 E., Oregon, including trees of all species, with basal diameters of 4 inches and upward:

	<i>Per cent.</i>
Yellow pine	20
Sugar pine.....	3
White pine	2
Red fir	55
White fir.....	10
Noble fir.....	9.2
Yew, etc.....	.8

TOWNSHIP 38 SOUTH, RANGE 5 EAST.

The western and central areas of this township comprise high, rocky ridges which here form the backbone of the main range of the Cascades. They have been heavily timbered, but are now badly burned and covered with wide, dense brush growths surrounding irregular stands of red, white, and noble fir. The eastern portions consist of a marshy area called Buck Lake, a level flat north thereof, burned in recent times and now reforested with a thin growth of lodgepole pine, and an area of rocky slopes east of Buck Lake bearing scattered stands of medium quality yellow pine and much brush, the result of fires.

Forested and other areas in T. 38 S., R. 5 E., Oregon.

	<i>Acres.</i>
Forested area.....	17,040
Nonforested area (burned, 3,000; meadows, etc., 3,000)	6,000
Badly burned area.....	4,000
Logged area.....	None.

Total stand of timber in T. 38 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	40	36,000,000	45,000,000
Sugar pine.....	2.2	2,000,000	2,000,000
White pine	1.1	1,000,000	1,200,000
Red fir	56.7	51,000,000	90,000,000
White fir			4,000,000
Noble fir			13,000,000
Incense cedar.....			300,000
Western hemlock			500,000
Total		90,000,000	156,000,000

Composition of forest in T. 38 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward:

	Per cent.
Yellow pine	25
Sugar pine	1
White pine	Occasional trees.
Lodgepole pine.....	6
Red fir.....	55
White fir	5
Noble fir.....	8
Incense cedar	Scattered trees.
Western hemlock	Scattered trees.

TOWNSHIP 38 SOUTH, RANGE 6 EAST.

The central and southern portions of the township comprise well-timbered ridges and slopes bordering Spencer Creek—a continuation of the heavy forest in T. 39 S., R. 6 E.

The northern areas consist of marshy tracts at the south end of Buck Lake and burned and brushed over slopes.

Forested and other areas in T. 38 S., R. 6 E., Oregon.

	Acres.
Forested area	19,440
Nonforested area (burned).....	3,600
Badly burned area	5,000
Logged area.....	None.

Total stand of timber in T. 38 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	28.6	40,000,000	64,000,000
Sugar pine.....	14.3	20,000,000	22,000,000
White pine.....	2	3,000,000	3,000,000
Red fir.....	46	65,000,000	103,000,000
White fir.....			6,000,000
Noble fir.....	7.2	10,000,000	15,000,000
Alpine hemlock.....			2,000,000
Engelmann spruce.....	1.4	2,000,000	3,000,000
Total.....		140,000,000	218,000,000

Composition of forest in T. 38 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine.....	30
Sugar pine.....	6
White pine.....	.8
Red fir.....	45
White fir.....	5
Noble fir.....	10
Alpine hemlock.....	2
Western hemlock.....	.2
Engelmann spruce.....	1

TOWNSHIP 38 SOUTH, RANGE 7 EAST.

The western areas of the township comprise a portion of Aspen Lake, a shallow sheet of water, and steep, rocky slopes forming the divide between Aspen Lake and Spencer Creek. The eastern portion of the township consists of a rolling lava plateau with low ridges in the eastern sections. The plateau portion is covered with a nearly uniform stand of forest of good quality, yellow pine largely predominating.

The forest is fire marked throughout.

Forested and other areas in T. 38 S., R. 7 E., Oregon.

	<i>Acres.</i>
Forested area.....	18,540
Nonforested area (lakes, marshes, and glades).....	4,500
Badly burned area.....	3,200
Logged area.....	None.

Total stand of timber in T. 38 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	86.5	160,000,000	118,000,000
Red fir	13.5	25,000,000	57,000,000
White fir			15,700,000
Total		185,000,000	190,700,000

Composition of forest in T. 38 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	60
Red fir	30
White fir	8
Western juniper	2

TOWNSHIP 38 SOUTH, RANGE 8 EAST.

The eastern and central areas of this township consist chiefly of marsh, bordering Upper Klamath Lake, and areas covered with the waters of this lake. The western tracts carry thin stands of yellow pine and small-growth red and white fir scattered over low lava ridges. Fires have run throughout, and in the vicinity of Long Lake Valley, a marshy meadow, have burned 85 per cent of the forest.

Forested and other areas in T. 38 S., R. 8 E., Oregon.

	<i>Acres.</i>
Forested area	5,760
Nonforested area (marsh and lake)	17,280
Badly burned area	1,500
Logged area (culled for domestic use, 30 per cent)	None.

Total stand of timber in T. 38 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	8,000,000	14,300,000
Red fir			3,500,000
White fir			3,960,000
Total		8,000,000	21,760,000

Composition of forest in T. 38 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	74
Red fir.....	10
White fir.....	15
Sugar pine.....	} 1
Lodgepole pine.....	
Incense cedar.....	
Western juniper.....	

TOWNSHIP 38 SOUTH, RANGE 9 EAST.

The western portions of the township comprise meadow, marsh, and sagebrush-covered semiarid tracts. The central and eastern sections are hilly regions, the ridges mostly nonforested on the western slopes and timbered on the summits and eastern sides with a thin, light forest mostly valuable for fuel purposes.

Forested and other areas in T. 38 S., R. 9 E., Oregon.

	Acres.
Forested area.....	5,760
Nonforested area (lake, marsh, and semiarid tracts).....	17,280
Badly burned area.....	800

Total stand of timber in T. 38 S., R. 9 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine.....	100	4,500,000	11,520,000

Composition of forest in T. 38 S., R. 9 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	99
Western juniper.....	1

TOWNSHIP 38 SOUTH, RANGE 10 EAST.

The eastern and central areas of the township consist of grassy and marshy tracts around Swan Lake; the western part consists of low ranges of hills which bear thin stands of yellow pine of small dimensions.

Forested and other areas in T. 38 S., R. 10 E., Oregon.

	Acres.
Forested area.....	10,880
Nonforested area (meadow and agricultural lands).....	12,160
Logged area (culled 30 per cent).....	1,100

Total stand of timber in T. 38 S., R. 10 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	11, 000, 000	22, 000, 000

Composition of forest in T. 38 S., R. 10 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	95
Western juniper	4
Poplar, etc.	1

TOWNSHIP 38 SOUTH, RANGE 11½ EAST.

This township consists chiefly of nonforested areas in and adjoining Alkali Flat, a semiarid, sagebrush-covered region.

In the southwestern areas are low hills, which carry a scattered growth of western juniper, with now and then a yellow pine.

Forested and other areas in T. 38 S., R. 11½ E., Oregon.

	Acres.
Forested area	1, 640
Nonforested area (grazing, agricultural, and semiarid lands)	21, 400

Total stand of timber in T. 38 S., R. 11½ E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine			2, 240, 000

Composition of forest in T. 38 S., R. 11½ E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	5
Western juniper	95

TOWNSHIP 38 SOUTH, RANGE 11 EAST.

This township was not personally examined, but was estimated from information.


Forested and other areas in T. 38 S., R. 11 E., Oregon.

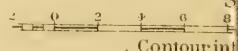
	Acres.
Forested area	14, 040
Nonforested area	9, 000



PART OF SOUTHERN OREGON SHOWING
Prepared under the direction of H. H. Henshaw

BY JOHN S. GARDNER


Lodgepole pine


Contour interval 100 feet



DISTRIBUTION OF LODGEPOLE PINE
 by Gannett, Geographer in charge
 EIBERG

0 2 4 6 8 10 MILES
 1500 feet

JULIUS BIEN & CO. LITH. N.Y.

Total stand of timber in T. 38 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	38,000,000	53,000,000
Red fir			5,000,000
White fir			4,000,000
Total		38,000,000	62,000,000

TOWNSHIP 38 SOUTH, RANGE 12 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 38 S., R. 12 E., Oregon.

Forested area	Acres. 17,240
Nonforested area	5,800

Total stand of timber in T. 38 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	40,000,000	84,000,000
White fir			2,000,000
Incense cedar			500,000
Total		40,000,000	86,500,000

TOWNSHIP 38 SOUTH, RANGE 13 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 38 S., R. 13 E., Oregon.

Forested area	Acres. 13,140
Nonforested area	9,900

Total stand of timber in T. 38 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	28,000,000	38,000,000
White fir			4,000,000
Incense cedar			2,000,000
Total		28,000,000	44,000,000

TOWNSHIP 38 SOUTH, RANGE 14 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 38 S., R. 14 E., Oregon.

Forested area	Acres.	9,040
Nonforested area		14,000

Total stand of timber in T. 38 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	5,500,000	8,000,000

TOWNSHIP 39 SOUTH, RANGE 2 WEST.

This township is largely made up of areas semiarid in character, supporting extensive brush growths, but little timber.

The once forested tracts have been badly burned, and in place of the forest have come oak copses, madroña, and thickets of "chaparral."

The forest has been pretty well culled of its dimension stuff long ago, and what remains is mostly small growth and of little commercial value.

Forested and other areas in T. 39 S., R. 2 W., Oregon.

Forested area	Acres.	9,040
Nonforested area (burned, 2,500; naturally nonforested, 11,500)		14,000
Badly burned area		2,500
Logged area (culled 50 per cent)		All.

Total stand of timber in T. 39 S., R. 2 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	81.3	13,000,000	29,000,000
Red fir	18.7	3,000,000	6,000,000
Total		16,000,000	35,000,000

Composition of forest in T. 39 S., R. 2 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	80
Red fir	10
Oak, madroña	10

TOWNSHIP 39 SOUTH, RANGE 1 WEST.

This township comprises steep rocky slopes, draining partly into Applegate Creek, partly into Bear Creek.

Originally of good proportion, the forest has been culled during many years and stripped of its best timber, only a trace remaining.

Fires have wrought great havoc and have transformed many of the slopes into great brush heaps with thin lines of half-dead trees in their midst.

Forested and other areas in T. 39 S., R. 1 W., Oregon.

	Acres.
Forested area	17,240
Nonforested area (rocky slopes, agricultural, etc.)	5,800
Badly burned area	3,100
Logged area (culled throughout 45 per cent)	All.

Total stand of timber in T. 39 S., R. 1 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	70	35,000,000	73,000,000
Sugar pine.....	8	4,000,000	9,000,000
Red fir	22	11,000,000	21,000,000
Total		50,000,000	103,000,000

Composition of forest in T. 39 S., R. 1 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	70
Sugar pine.....	8
Red fir	20
Oak, madroña.....	2

TOWNSHIP 39 SOUTH, RANGE 1 EAST.

The extreme western portions of this township consist of low, sparsely timbered slopes, with heavier stands in the ravines; the central portions comprise agricultural and grazing lands while the eastern mainly include semiarid, rocky, nonforested slopes.

The forest is of poor quality throughout. Since the first settlement of the region it has been culled and burned repeatedly. Private holdings have conserved some of the better portions. In general the timber is of little commercial value.

Forested and other areas in T. 39 S., R. 1 E., Oregon.

	Acres.
Forested area	8,040
Nonforested area	15,000
Logged area (culled 50 per cent)	All.

Total stand of timber in T. 39 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	68.7	11,000,000	22,000,000
Sugar pine	18.7	3,900,000	7,000,000
Red fir	12.5	2,300,000	6,000,000
Total		16,000,000	35,000,000

Composition of forest in T. 39 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	60
Sugar pine	15
Red fir	20
Oak, madroña	5

TOWNSHIP 39 SOUTH, RANGE 2 EAST.

This township consists mostly of steep rocky breaks rising abruptly from Bear Creek Valley toward the Siskiyou-Cascades junction in the east.

A large proportion of the region is naturally nonforested. The forested areas bear thin stands of scattered yellow pine and red fir mixed with copses of oak. The timber is all of poor quality.

Forested and other areas in T. 39 S., R. 2 E., Oregon.

	<i>Acres.</i>
Forested area	10,540
Nonforested area (mostly rocky breaks naturally nonforested)	12,500
Badly burned area	1,200
Logged area	Culled throughout.

Total stand of timber in T. 39 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	6,000,000	7,000,000
Red fir			3,000,000
Total		6,000,000	10,000,000

Composition of forest in T. 39 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	62
Red fir	35
Oak, etc	3

TOWNSHIP 39 SOUTH, RANGE 3 EAST.

This township covers the areas at the junction of the Siskiyou and the Cascade ranges, and consists of rocky flats and ridges forming the upper drainage basin of Jenny Creek.

The forest contains a large quantity of red fir, small in growth and badly damaged by the numerous fires which have overrun the township in recent times. The yellow pine is short bodied, as is the usual condition on the rocky areas of this region.

Where fires have burned all the timber, brush growths are the rule.

Forested and other areas in T. 39 S., R. 3 E., Oregon.

	Acres.
Forested area	19,140
Nonforested area, (2,000 burned clean of timber)	3,900
Badly burned area	3,000
Logged area	None.

Total stand of timber in T. 39 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	51.3	40,000,000	65,000,000
Sugar pine	10.2	8,000,000	10,000,000
Red fir	38.5	30,000,000	55,000,000
White fir			6,300,000
Total		78,000,000	136,300,000

Composition of forest in T. 39 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	60
Sugar pine	3
Red fir	32
White fir	5

TOWNSHIP 39 SOUTH, RANGE 4 EAST.

This township comprises most of the eastern areas of the Jenny Creek watershed and consists, in its eastern portion, of a level or gently rolling plateau region; in its western sections of hilly and broken ground. Its central areas contain Johnson Prairie, a large glade with many small ramifications. Fires have run throughout the entire extent of the township. The northern areas are very badly burned, extensive tracts being completely covered with brush growth as a result. The central and southern portions carry a heavy forest of yellow pine, excellent in quality and easy of access. The red fir is inferior in growth and quality, due to the many fires in the region.

FOREST RESERVES.

Forested and other areas in T. 39 S., R. 4 E., Oregon.

	Acres.
Forested area	18,040
Nonforested area (glades and meadows, 2,000; burned 3,000)	5,000
Badly burned area	5,600
Logged area	None.

Total stand of timber in T. 39 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	57.5	100,000,000	122,000,000
Sugar pine	14.3	25,000,000	31,000,000
Red fir	25.8	45,000,000	80,000,000
White fir	1.2	2,000,000	4,000,000
Incense cedar	1.2	2,000,000	2,850,000
Total		174,000,000	239,850,000

Composition of forest in T. 39 S., R. 4 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	50
Sugar pine	8
Red fir	40
White fir	} 2
Incense cedar	

TOWNSHIP 39 SOUTH, RANGE 5 EAST.

This township consists of a plateau region which forms portions of the summit of the main range of the Cascades in this region.

The northwestern areas are chiefly meadow lands, glades belonging to the Johnson Prairie tracts. The balance of the township carries a tolerably compact body of excellent yellow pine, largely composed of standards.

Fires have run everywhere in the forest stands, suppressing the young growth, burning great quantities of the firs, and filling the forest with a great many small brushed-over tracts in place of the consumed timber.

Forested and other areas in T. 39 S., R. 5 E., Oregon.

	Acres.
Forested area	21,140
Nonforested area (meadows and glades)	1,900
Badly burned area	6,000
Logged area	None.

Total stand of timber in T. 39 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	61.5	160,000,000	188,000,000
Sugar pine.....	10.6	28,000,000	28,000,000
Red fir	25	65,000,000	95,000,000
White fir	1.5	3,000,000	10,000,000
Noble fir .....	.7	2,000,000	4,000,000
Incense cedar.....	.7	2,000,000	3,000,000
Total.....		260,000,000	328,000,000

Composition of forest in T. 39 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine.....	60
Lodgepole pine	1
White fir	2.9
Incense cedar .....	.1
Sugar pine.....	4
Red fir	30
Noble fir.....	2

TOWNSHIP 39 SOUTH, RANGE 6 EAST.

This township in part consists of areas along the summit of the Cascades, and has not elevation sufficient to produce a true subalpine forest. In part it consists of slopes on the eastern side of the range draining into Spencer Creek.

The forest has been severely burned in places, followed by the inevitable brush growths. The western areas and the slopes near Spencer Creek bear good stands of mill timber.

Forested and other areas in T. 39 S., R. 6 E., Oregon.

	<i>Acres.</i>
Forested area	18,840
Nonforested area (burned, 2,000; glades and meadows, 2,200)	4,200
Badly burned area	5,400
Logged area.....	None.

FOREST RESERVES.

Total stand of timber in T. 39 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	32.6	50,000,000	60,000,000
Sugar pine.....	9.8	15,000,000	15,000,000
Red fir	53.7	82,000,000	105,000,000
White fir	3.9	6,000,000	15,000,000
Incense cedar			800,000
Total.....		153,000,000	195,800,000

Composition of forest in T. 39 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	31
Sugar pine.....	7
Red fir	50
White fir	10
Incense cedar	1
Lodgepole pine	1

TOWNSHIP 39 SOUTH, RANGE 7 EAST.

This township is situated on the eastern slope of the main range of the Cascades. Its western areas contain stands of forest of medium density and quality; its southern areas have thin growths of forest, largely western juniper; its eastern areas adjoin the nonforested semi-arid tracts west of Upper Klamath Lake and carry scattered stands of forest of small commercial value.

Forested and other areas in T. 39 S., R. 7 E., Oregon.

	<i>Acres.</i>
Forested area	18,040
Nonforested area (naturally nonforested)	5,000
Badly burned area	1,850
Logged area (culled 35 per cent)	2,000

Total stand of timber in T. 39 S., R. 7 E., Oregon.

Species.	Local practice..		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	76.4	42,000,000	70,000,000
Sugar pine.....	5.4	3,000,000	3,000,000
Red fir	18.2	10,000,000	15,000,000
White fir			7,000,000
Incense cedar			900,000
Total.....		55,000,000	95,900,000

Composition of forest in T. 39 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	73
Sugar pine.....	3
Red fir	13
White fir.....	7
Incense cedar.....	.2
Western juniper	3.8

TOWNSHIP 39 SOUTH, RANGE 8 EAST.

The western sections of the township consist of low lava hills sparsely timbered, inclosing marshy or sagebrush-covered flats. The eastern areas comprise sagebrush-covered, nonforested semiarid flats and low hills. The forest is of poor quality owing to proximity of arid climatic conditions and to frequent fires.

Forested and other areas in T. 39 S., R. 8 E., Oregon.

	Acres.
Forested area	8,320
Nonforested area (meadows and semiarid areas).....	14,720
Badly burned area.....	4,600

Total stand of timber in T. 39 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan prac- tice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	6,000,000	10,880,000

Composition of forest in T. 39 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	97
Western juniper.....	3

TOWNSHIP 39 SOUTH, RANGE 9 EAST.

This township is situated east of the Cascades and consists of marsh and sagebrush flats and hills. The area of the township is 23,040 acres and it contains no forested tracts.

TOWNSHIP 39 SOUTH, RANGE 10 EAST.

This township was estimated from information and was not personally examined.

Forested and other areas in T. 39 S., R. 10 E., Oregon.

	Acres.
Forested area.....	4,540
Nonforested area	18,500

FOREST RESERVES.

Total stand of timber in T. 39 S., R. 10 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	6,000,000	10,000,000

TOWNSHIP 39 SOUTH, RANGE 11½ EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 39 S., R. 11½ E., Oregon.

Forested area	Acres. 7,680
Nonforested area	15,360

Total stand of timber in T. 39 S., R. 11½ E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	16,000,000	22,500,000

TOWNSHIP 39 SOUTH, RANGE 11 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 39 S., R. 11 E., Oregon.

Forested area	Acres. 15,440
Nonforested area	7,600

Total stand of timber in T. 39 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	55,000,000	85,000,000
White fir			5,000,000
Total		55,000,000	90,000,000

TOWNSHIP 39 SOUTH, RANGE 12 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 39 S., R. 12 E., Oregon.

Forested area	Acres. 7,640
Nonforested area	15,400

Total stand of timber in T. 39 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan stand-ard.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	30,000,000	42,000,000
White fir			4,000,000
Total		30,000,000	46,000,000

TOWNSHIP 39 SOUTH, RANGE 13 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 39 S., R. 13 E., Oregon.

Forested area	Acres. 4,440
Nonforested area	18,600

Total stand of timber in T. 39 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan prac-tice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	16,000,000	22,000,000

TOWNSHIP 39 SOUTH, RANGE 14 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 39 S., R. 14 E., Oregon.

Forested area	Acres. 8,040
Nonforested area	15,000

Total stand of timber in T. 39 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan prac-tice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	5,000,000	8,000,000

TOWNSHIP 40 SOUTH, RANGE 2 WEST.

The northern areas of this township consist of low broken spurs and ridges; the southern comprise high steep slopes, all of which are formed by northward projecting ridges from the Siskiyou Mountains; the whole constituting the different divides between the various Applegate forks.

The forest in the southern areas consists mostly of noble fir at the higher elevations; at lower levels it changes to a growth in which red fir forms 60 per cent of the stand. The southern tracts of the township have been burned clean to the extent of 30 per cent in recent times, and are now reforesting with a nearly pure growth of red fir. The northern portions carry stands of yellow pine, much culled and extensively mixed with oak copses and madroña of large growth.

Forested and other areas in T. 40 S., R. 2 W., Oregon.

	Acres.
Forested area	19, 240
Nonforested area (rocks and glades)	3, 800
Badly burned area	4, 300
Logged area (culled 65 per cent)	1, 800

Total stand of timber in T. 40 S., R. 2 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	56.	42, 000, 000	60, 000, 000
Sugar pine	6. 6	5, 000, 000	5, 000, 000
Red fir	29. 3	22, 000, 000	45, 000, 000
Noble fir	6. 6	5, 000, 000	7, 000, 000
Incense cedar	1. 4	1, 000, 000	2, 000, 000
Total		75, 000, 000	119, 000, 000

Composition of forest in T. 40 S., R. 2 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	40.
Sugar pine	2.
Red fir	45.
Noble fir	3.
Incense cedar .....	.5
Madroña	} 9.5
Oak	

TOWNSHIP 40 SOUTH, RANGE 1 WEST.

This township consists of high slopes and summits of the Siskiyou Range. The highest slopes are largely nonforested, either bare, rocky expanses or grassy glades predominating. The lower elevations bear moderately heavy stands of fair quality. The forest is seared by fire in all of its parts, and is generally difficult of access.

A portion of the township forms part of the Ashland Forest Reserve.

Forested and other areas in T. 40 S., R. 1 W., Oregon.

	Acres.
Forested area.....	17,040
Nonforested area (bare, rocky summits, etc., 4,200; burned clean, 2,800).....	6,000
Badly burned area.....	6,200
Logged.....	None.

Total stand of timber in T. 40 S., R. 1 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	28.5	20,000,000	26,000,000
Sugar pine	11.4	8,000,000	8,000,000
White pine			1,000,000
Red fir	40	28,000,000	55,000,000
White fir			3,000,000
Noble fir	17.2	12,000,000	14,000,000
Incense cedar.....	2.9	2,000,000	3,000,000
Total		70,000,000	110,000,000

Composition of forest in T. 40 S., R. 1 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine.....	20
Sugar pine.....	3
White pine.....	Scattered trees.
Red fir.....	50
White fir.....	3
Noble fir.....	12
Incense cedar.....	3
Oak, madroña.....	9

TOWNSHIP 40 SOUTH, RANGE 1 EAST.

This township consists chiefly of high rocky combs and ridges culminating in Siskiyou Peak. It forms the larger portion of the Ashland Forest Reserve. Along the higher slopes the forest occurs in scattered stands, largely composed of noble fir. The lower areas bear good stands of yellow and sugar pine. The red fir is mostly of small growth. Fires have run throughout the forest in the township. The summit of the ridge near Siskiyou Peak has been burned to the extent of 75 per cent within the last two or three years. Although a forest reserve for the purpose of supplying the town of Ashland with pure water, sheep are permitted to graze on the high slopes, defiling the water.

FOREST RESERVES.

Forested and other areas in T. 40 S., R. 1 E., Oregon.

	Acres.
Forested area	18,540
Nonforested area (glades, etc., 4,000; burned clean, 500)	4,500
Badly burned area	2,200
Logged area	500

Total stand of timber in T. 40 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan prac- tice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	21.8	21,000,000	36,000,000
Sugar pine.....	12.6	12,000,000	16,000,000
Red fir	26	25,000,000	50,000,000
Noble fir	36.4	35,000,000	50,000,000
White fir			8,000,000
Incense cedar.....	3.2	3,000,000	4,000,000
Total.....		96,000,000	164,000,000

Composition of forest in T. 40 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	23
Sugar pine.....	10
White pine.....	Scattered trees.
White-bark pine.....	Scattered trees.
Red fir	30
White fir	5
Noble fir	30
Incense cedar	2
Oak, madroña.....	5

TOWNSHIP 40 SOUTH, RANGE 2 EAST.

This township is situated on the northern slopes of the Siskiyou Mountains and consists of rocky, broken hills rising in the east and south to join the main range.

Fires have run through the forest in recent times, burning 30 per cent of the timber and badly searing the remainder. The stands are light and scattered among bare, rocky flats and glades and dense brush growths.

The larger portion of the timber consists of small-growth red fir of little commercial value.

Forested and other areas in T. 40 S., R. 2 E., Oregon.

	Acres.
Forested area	13,540
Nonforested area (burned, 3,000).....	6,500
Badly burned area	6,300
Logged area (culled 15 per cent).....	1,200

Total stand of timber in T. 40 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	20.8	5,000,000	15,000,000
Sugar pine	4.2	1,000,000	2,000,000
Red fir	75	18,000,000	45,000,000
White fir			2,000,000
Noble fir			4,000,000
Total		24,000,000	68,000,000

Composition of forest in T. 40 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	25
Sugar pine .....	.2
Red fir	58
White fir	4
Noble fir	6
Incense cedar .....	.1
Oak, madroña	6.7

TOWNSHIP 40 SOUTH, RANGE 3 EAST.

This township consists of ridges and canyons projecting eastward from the Siskiyou Mountains, and forms portion of the Jenny Creek drainage basin.

It is a very broken region, with the forest mostly burned up long ago and in its place dense brush growths or here and there grassed-over slopes.

The mill timber is of small growth and of little value.

Forested and other areas in T. 40 S., R. 3 E., Oregon.

	<i>Acres.</i>
Forested area	12,040
Nonforested area (fire glades 5,200)	11,000
Badly burned area	8,200
Logged area	None.

Total stand of timber in T. 40 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	22.2	10,000,000	16,000,000
Sugar pine	4.4	2,000,000	2,000,000
Red fir	73.4	33,000,000	51,200,000
Incense cedar			400,000
Total		45,000,000	69,600,000

Composition of forest in T. 40 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	25
Sugar pine .....	.1
White fir .....	.1
Red fir	70
Incense cedar .....	.1
Oak	4.7

TOWNSHIP 40 SOUTH, RANGE 4 EAST.

The eastern areas of this township consist of portions of the large lava plateau which flanks the main summit of the Cascade Range north of the Klamath River. The western portions of the township comprise broken, unevenly forested ridges draining into Jenny Creek.

The mill timber in the eastern sections forms heavy stands, is excellent in quality, and easy of access. Fires have marked the entire forest stand in the township, and have mostly suppressed the young growth; hence the forest is of an open character, with but little undergrowth.

Forested and other areas in T. 40 S., R. 4 E., Oregon.

	Acres.
Forested area	19,740
Nonforested area (naturally nonforested)	3,300
Logged area	None.

Total stand of timber in T. 40 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	56.5	120,000,000	132,000,000
Sugar pine	14.2	30,000,000	35,000,000
Red fir	28.3	60,000,000	70,000,000
White fir .....	.9	2,000,000	10,000,000
Incense cedar			1,000,000
Total		212,000,000	248,000,000

Composition of forest in T. 40 S., R. 4 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	60
Sugar pine	8
Red fir	30
White fir	1
Oak, incense cedar	1

TOWNSHIP 40 SOUTH, RANGE 5 EAST.

This township consists of a gently rolling lava plateau, a few low ridges here and there flanking and including portions of the main summit of the Cascade Range north of the Klamath River Canyon.

It bears a forest of noble proportions, ideally situated for lumbering operations. The most valuable components of the forest here are yellow and sugar pine. The growth of these two species is symmetrical and large, the sugar pine reaching basal diameters of 9 feet, and the yellow pine of 5 to 6 feet, with clear trunks 30 to 65 feet in length.

Fires have run through this stand of timber very many times, and there are not many trees not fire seared. The greatest damage has been done to the firs, both red and white, which therefore are largely defective and are not much cut for lumber. The young growth has also been destroyed, and reproduction is therefore defective.

The Pokegama Lumber Company operates here, sending the logs to their mills at Klamathon, on the Southern Pacific Railroad, by way of the Klamath River. They cut pine exclusively, and cut all pine clean as they go, leaving great accumulations of débris behind them for future fires. They take all trees far into the crown, trimming off the limbs and making the last cut on a basis of 7 to 8 inches in diameter at the small end. In consequence they realize about 40 per cent higher yield than the customary cruisers' estimates provide for.

Forested and other areas in T. 40 S., R. 5 E., Oregon.

	Acres.
Forested area	20, 440
Nonforested area	2, 600
Logged area	1, 600

Total stand of timber in T. 40 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	50	150, 000, 000	170, 000, 000
Sugar pine.....	17. 7	53, 000, 000	60, 000, 000
Red fir	30	90, 000, 000	100, 000, 000
White fir	1. 7	5, 000, 000	17, 000, 000
Incense cedar.....	. 6	2, 000, 000	3, 620, 000
Total		300, 000, 000	350, 620, 000

Total stand of timber as per actual cutting practice, 600,000,000 feet B. M.

Composition of forest in T. 40 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	50
Sugar pine	15
Red fir	30
White fir	4.5
Incense cedar .....	.5

TOWNSHIP 40 SOUTH, RANGE 6 EAST.

The western and central areas of this township consist of a continuation of the lava plateau referred to under T. 41 S., R. 5 E., and the forest is of similar character. The canyon of the Klamath River cuts the eastern portion of the township in two. It is a rocky and precipitous gorge, the slopes and bottom timbered with scattered trees and the forest along the north bluff badly burned.

East of the river we have heavy stands of yellow pine, logged in places by small local concerns.

Forested and other areas in T. 40 S., R. 6 E., Oregon.

	Acres.
Forested area	21,240
Nonforested area (glades)	1,800
Badly burned area	2,200
Logged area	1,800

Total stand of timber in T. 40 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	63.7	165,000,000	190,000,000
Sugar pine	15.4	40,000,000	45,000,000
Red fir	19.3	50,000,000	75,000,000
White fir	1.6	4,000,000	9,000,000
Incense cedar			1,000,000
Total		259,000,000	320,000,000

Composition of forest in T. 40 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	60
Sugar pine	15
Red fir	22
White fir	} 3
Incense cedar	}

TOWNSHIP 40 SOUTH, RANGE 7 EAST.

The western areas of the township consist of plateau tracts; the eastern comprise rocky and craggy declivities sloping toward Lower Klamath Lake.

The western portions of the township contain stands of yellow pine of excellent quality and easy of access. The growth is much mixed with a great quantity of red fir of dimensions unfit for mill timber; and is intersected in all directions by narrow, nonforested, rocky or grassy glades.

Forested and other areas in T. 40 S., R. 7 E., Oregon.

	Acres.
Forested area	21,740
Nonforested area (glades and clearings)	1,300
Badly burned area	2,400
Logged area	1,500

Total stand of timber in T. 40 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	77.7	140,000,000	175,000,000
Sugar pine	3.4	6,000,000	8,000,000
Red fir	18.9	34,000,000	65,000,000
Total		180,000,000	248,000,000

Composition of forest in T. 40 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	40
Sugar pine	5
Red fir	55
Incense cedar	Scattered trees.

TOWNSHIP 40 SOUTH, RANGE 8 EAST.

The eastern areas of this township consist of marsh and tule lands bordering Lower Klamath Lake. The western portions comprise rocky slopes carrying stands of yellow pine, mostly of inferior quality.

Forested and other areas in T. 40 S., R. 8 E., Oregon.

	Acres.
Forested area	6,140
Nonforested area (rocky glades, marsh, and agricultural land)	16,900
Badly burned area	1,000
Logged area	1,600

FOREST RESERVES.

Total stand of timber in T. 40 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	87	20,000,000	40,000,000
Red fir	13	3,000,000	9,000,000
White fir			3,980,000
Total		23,000,000	52,980,000

Composition of forest in T. 40 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	85
Red fir	10
White fir, etc	5

TOWNSHIP 40 SOUTH, RANGE 9 EAST.

The township consists of marsh lands, and in the eastern areas of sagebrush-covered tracts which bear, here and there, scattered trees of western juniper. The area of the township is 23,040 acres, none of which are forested.

TOWNSHIP 40 SOUTH, RANGE 10 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 40 S., R. 10 E., Oregon.

	<i>Acres.</i>
Forested area	7,040
Nonforested area	16,000

Total stand of timber in T. 40 S., R. 10 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	30,000,000	42,000,000

TOWNSHIP 40 SOUTH, RANGE 11 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 40 S., R. 11 E., Oregon.

	<i>Acres.</i>
Forested area	5,040
Nonforested area	18,000

Total stand of timber in T. 40 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine			5,000,000

TOWNSHIP 40 SOUTH, RANGE 12 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 40 S., R. 12 E., Oregon.

Forested area	Acres. 11,040
Nonforested area	12,000

Total stand of timber in T. 40 S., R. 12 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	36,000,000	50,000,000

TOWNSHIP 40 SOUTH, RANGE 13 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 40 S., R. 13 E., Oregon.

Forested area	Acres. 10,240
Nonforested area	12,800

Total stand of timber in T. 40 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	95.2	40,000,000	50,000,000
Red fir	4.8	2,000,000	5,000,000
White fir			6,000,000
Incense cedar			1,000,000
Total		42,000,000	62,000,000

TOWNSHIP 40 SOUTH, RANGE 14 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 40 S., R. 14 E., Oregon.

Forested area	Acres. 3,240
Nonforested area	19,800

Total stand of timber in T. 40 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	10,000,000	15,000,000

TOWNSHIP 40 SOUTH, RANGE 14½ EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 40 S., R. 14½ E., Oregon.

Forested	Area. 13,040
Nonforested	10,000

Total stand of timber in T. 40 S., R. 14½ E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	39,000,000	45,000,000

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 2 WEST.

This fractional township comprises a portion of the summit of the Siskiyou Range near Sterling Peak, and the southern slopes therefrom. It includes a large amount of bare rocky summits and slopes naturally deforested.

The timber along the higher slopes is mostly composed of noble fir of large dimensions and often of very close stand. It is mixed with small percentages of white pine and red fir. The lower slopes carry yellow and sugar pine of medium quality. The larger proportion of the timber in the township is very difficult of access, and fire has marked it all.

Forested and other areas in T. 41 S., R. 2 W., Oregon.

	Acres.
Forested area	7,200
Nonforested area (rocks and glades)	3,000
Badly burned area	2,000
Logged area	None.

Total stand of timber in T. 41 S., R. 2 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Feet B. M.</i>
Yellow pine	22.5	14,000,000	16,000,000
Sugar pine	8	5,000,000	5,000,000
White pine			3,000,000
Red fir	19.2	12,000,000	22,000,000
White fir			1,600,000
Noble fir	48.1	30,000,000	40,000,000
Incense cedar	2.1	1,300,000	1,500,000
Total		62,300,000	89,100,000

Composition of forest in T. 41 S., R. 2 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	20
Sugar pine	5
White pine	3
Red fir	25
White fir	5
Noble fir	40
Incense cedar	2

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 1 WEST.

This fractional township comprises spurs and canyons projecting southward from the Siskiyou Range.

Along the higher slopes the region is rocky and in part covered with light brush growth, in part with thin stands of forest.

The lower and intermediate slopes carry stands of good timber, the yellow pine and the sugar pine largely composed of veterans in good preservation. Fires have run throughout the township.

Forested and other areas in T. 41 S., R. 1 W., Oregon.

	Acres.
Forested area	9,000
Nonforested area (rocky summits, glades, etc.)	1,200
Badly burned area	1,000
Logged area	None.

FOREST RESERVES.

Total stand of timber in T. 41 S., R. 1 W., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	65.7	50,000,000	60,000,000
Sugar pine.....	13.1	10,000,000	12,000,000
Red fir	19.9	15,000,000	28,000,000
White fir.....			3,000,000
Noble fir.....			5,000,000
Incense cedar.....	1.3	1,000,000	1,700,000
Total.....		76,000,000	109,700,000

Composition of forest in T. 41 S., R. 1 W., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	52
Sugar pine.....	10
White pine.....	Scattered trees.
Red fir	28
White fir	1
Noble fir	5
Incense cedar.....	.5
Oak.....	3.5

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 1 EAST.

This fractional township consists of spurs and canyons projecting southward from the Siskiyou Range.

The forest along the lower slopes is of excellent quality and proportion, and is remarkable for the large percentage of incense cedar of large growth which it contains.

The upper slopes have been badly overrun by fires in recent times, and are thinly covered with forest in the midst of dense brush growths.

Forested and other areas in T. 41 S., R. 1 E., Oregon.

	<i>Acres.</i>
Forested area	9,900
Nonforested area	300
Badly burned area	1,500
Logged area (culled 80 per cent)	1,200

Total stand of timber in T. 41 S., R. 1 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	44	22,000,000	40,000,000
Sugar pine.....	30	15,000,000	15,000,000
Red fir.....	6	3,000,000	4,240,000
White fir.....	6	3,000,000	10,000,000
Incense cedar.....	14	7,000,000	8,000,000
Total.....		50,000,000	77,240,000

Composition of forest in T. 41 S., R. 1 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine.....	65
Sugar pine.....	14
Red fir.....	5
White fir.....	10
Incense cedar.....	3
Oak.....	3

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 2 EAST.

The central and southern portions of this township are situated on the summit and southern slopes of the Siskiyou Range. The township is very thinly forested, consisting largely of grassy or brushy semiarid slopes. The northern portion of the township contains scattered stands of timber much damaged by fires and of little commercial value.

Forested and other areas in T. 41 S., R. 2 E., Oregon.

	<i>Acres.</i>
Forested area.....	8,200
Nonforested area (rocks, semiarid tracts, etc.).....	2,000
Badly burned area.....	4,000
Logged area.....	None.

Total stand of timber in T. 41 S., R. 2 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine.....	20	1,000,000	3,000,000
Sugar pine.....	40	2,000,000	2,000,000
Red fir.....	40	2,000,000	4,600,000
White fir.....			1,000,000
Total.....		5,000,000	10,600,000

Composition of forest in T. 41 S., R. 2 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	30
Sugar pine	2
Red fir	55
White fir	10

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 3 EAST.

This township consists of steep hills very sparsely forested, but covered with dense brush growths as the result of fires. Most of the timber was burned in recent times. There is no reforestation. The mill timber, scattered among the brush heaps, is of poor quality and practically inaccessible.

Forested and other areas in T. 41 S., R. 3 E., Oregon.

	Acres.
Forested area	7,000
Nonforested area (due to fires, 2,000)	3,200
Badly burned area	4,200
Logged area	None.

Total stand of timber in T. 41 S., R. 3 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	66.6	2,000,000	6,000,000
Red fir	33.4	1,000,000	4,000,000
Total		3,000,000	10,000,000

Composition of forest in T. 41 S., R. 3 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	60
Red fir	35
Sugar pine	} 5
Incense cedar	
Oak	

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 4 EAST.

The greater portion of this township consists of steep ridges bordering Jenny Creek, with a plateau-like tract in the northeastern area.

The southern areas of the township are timbered with light, open stands interspersed with many oak copses. The northern portions bear a forest of moderate density, easy of access, with stands of timber of good quality and body.

Forested and other areas in T. 41 S., R. 4 E., Oregon.

	Acres.
Forested area	7,800
Nonforested area (glades, meadows, rocks)	2,400
Badly burned area	800
Logged area	None.

Total stand of timber in T. 41 S., R. 4 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	66	33,000,000	42,000,000
Sugar pine	8	4,000,000	4,800,000
Red fir	24	12,000,000	17,800,000
White fir			400,000
Incense cedar	2	1,000,000	2,000,000
Total		50,000,000	67,000,000

Composition of forest in T. 41 S., R. 4 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	50
Sugar pine	5
Red fir	30
Incense cedar	2
White fir	
Western juniper	1
Oak	12

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 5 EAST.

This township consists of portion of the large lava plateau lying immediately north of the Klamath River and stretching northerly toward the volcanic areas south of Mount Pitt.

The region is well timbered with a massive, though open, forest. The pine is of excellent quality, long bodied, and composed mostly of large standards. Undergrowth is scanty and young growth is deficient, owing to frequently repeated fires. The Pokegama Lumber Company has here extensive logging camps.

Forested and other areas in T. 41 S., R. 5 E., Oregon.

	Acres.
Forested area	10,200
Logged area (culled 80 per cent)	2,000

FOREST RESERVES.

Total stand of timber in T. 41 S., R. 5 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	51.2	40,000,000	50,000,000
Sugar pine.....	16.6	13,000,000	15,000,000
Red fir	32.2	25,000,000	30,000,000
White fir.....			4,000,000
Incense cedar.....			1,000,000
Total.....		78,000,000	100,000,000

Composition of forest in T. 41 S., R. 5 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	<i>Per cent.</i>
Yellow pine	50
Sugar pine.....	10
Red fir	36
White fir	} 4
Incense cedar.....	

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 6 EAST.

The northern and western areas of the township consist chiefly of rocky and precipitous bluffs inclosing Klamath River Canyon. The eastern sections comprise portions of a plateau-like tract bordering the canyon on the south.

The bottom of the canyon is sparsely timbered, as are the slopes leading down into it. The plateau portion carries a heavy forest stand, which is broken by numerous small nonforested glades. The principal mill timber is yellow pine which is here of excellent quality and size. The red fir is mostly of small growth. Fire has marked the timber throughout the township.

Forested and other areas in T. 41 S., R. 6 E., Oregon.

Forested area	9,000
Nonforested area (rocky bluffs, glades, meadows)	1,200
Logged area.....	1,200

Total stand of timber in T. 41 S., R. 6 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	87	50,000,000	58,000,000
Red fir	13	8,000,000	29,500,000
Total.....		58,000,000	87,500,000

Composition of forest in T. 41 S., R. 6 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	45
Red fir	55

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 7 EAST.

This township comprises slopes of the divide which separates in part the waters of the Klamath River and those of Lower Klamath Lake. It is generally a steep and rocky region.

The yellow pine on the lower slopes is of good quality. Along the higher elevations it is largely replaced with red fir of small growth. The forest is fire seared throughout.

Forested and other areas in T. 41 S., R. 7 E., Oregon.

	Acres.
Forested area	9,200
Nonforested area (bare rocks and glades)	1,000
Badly burned area	1,300
Logged area	None.

Total stand of timber in T. 41 S., R. 7 E., Oregon.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	88.6	62,000,000	78,000,000
Red fir	11.4	8,000,000	17,000,000
Total		70,000,000	95,000,000

Composition of forest in T. 41 S., R. 7 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	75
Red fir	25

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 8 EAST.

The eastern areas of the township consist of marshy tracts along Lower Klamath Lake. The western portions comprise rocky slopes forested with thin stands of yellow pine of inferior quality.

Forested and other areas in T. 41 S., R. 8 E., Oregon.

	Acres.
Forested area	2,800
Nonforested area (marsh)	8,320
Badly burned area	600
Logged area	None.

FOREST RESERVES.

Total stand of timber in T. 41 S., R. 8 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	100	6, 000, 000	12, 000, 000
Red fir			2, 000, 000
Total		6, 000, 000	14, 000, 000

Composition of forest in T. 41 S., R. 8 E., Oregon, including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	98
Red fir	2

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 9 EAST.

This township is situated in Lower Klamath Lake and comprises marsh and lake areas. Its area is 11,520 acres, none of which is forested.

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 10 EAST.

The area of this township is 11,520 acres, none of which is forested.

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 11 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 41 S., R. 11 E., Oregon.

	Acres.
Forested area	800
Nonforested area	10, 720

Total stand of timber in T. 41 S., R. 11 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine			4, 500, 000

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 12 EAST.

There are no forest areas in this township. The area of the township is 11,520 acres.

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 13 EAST.

This township was not personally examined, but was estimated from information.

Forested and other areas in T. 41 S., R. 13 E., Oregon.

Forested area	Acres. 8,520
Nonforested area	3,000

Total stand of timber in T. 41 S., R. 13 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	87.5	28,000,000	34,000,000
Red fir	12.5	4,000,000	7,000,000
White pine			3,000,000
Incense cedar			1,000,000
Total		32,000,000	45,000,000

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 14 EAST.

This township was not examined personally, but was estimated from information.

Forested area	Acres. 11,520
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Total stand of timber in T. 41 S., R. 14 E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine	100	45,000,000	55,000,000

FRACTIONAL TOWNSHIP 41 SOUTH, RANGE 14½ EAST.

The forest in this township consists chiefly of scattered stands of western juniper. The township was not personally examined, but was estimated from information.

Forested and other areas in T. 41 S., R. 14½ E., Oregon.

Forested area	Acres. 3,500
Nonforested areas	8,020

Total stand of timber in T. 41 S., R. 14½ E., Oregon.

Species.	Local practice.		Michigan practice.
	<i>Per cent.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
Yellow pine			3,000,000

ASHLAND FOREST RESERVE, OREGON.

BOUNDARIES.

Beginning at the northeast corner of section twenty-seven (27), township thirty-nine (39) south, range one (1) east, Willamette meridian; thence westerly along the surveyed and unsurveyed section line to the northwest corner of section twenty-five (25), township thirty-nine (39) south, range one (1) west; thence southerly along the section line to the southwest corner of section thirty-six (36), said township and range; thence westerly along the ninth (9th) standard parallel south to the northwest corner of section one (1), township forty (40) south, range one (1) west; thence southerly along the section line to the southwest corner of section thirteen (13), said township and range; thence easterly along the surveyed and unsurveyed section line to the point for the southeast corner of section fourteen (14), township forty (40) south, range one (1) east; thence northerly along the surveyed and unsurveyed section line to the northeast corner of section thirty-five (35), township thirty-nine (39) south, range one (1) east; thence westerly to the northwest corner of said section thirty-five (35); thence northerly to the northeast corner of section twenty-seven (27), said township and range, the place of beginning.

DESCRIPTION OF RESERVE.

This reserve is carved out of T. 39 S., Rs. 1 W. and 1 E., and T. 40 S., Rs. 1 W. and 1 E. It contains between 22,000 and 23,000 acres, hence does not quite cover the area of one township. The object of this reserve is to maintain the stability of the water heads and to preserve the volume and purity of Ashland Creek, which furnishes the water supply to the town of Ashland, Oregon.

The reserve consists of Siskiyou Peak, or Ashland Butte, as the mountain is locally called, and spurs radiating from it. The peak is an elevation rising from the crest of the Siskiyou Range, and attains a height of nearly 8,000 feet above sea level. The actual peak rises about 800 feet above the general crest line of the range in this locality. The eastern and western slopes of the peak have an easy descent and blend gradually with the crest line. The southern declivities slope sharply toward the Klamath Valley. The northern slopes break away in precipitous escarpments to form the head of the Ashland Creek Basin. Long spurs stretch away from the peak toward the north. The spurs on the south side are short. One of the northern spurs, on which is situated Mount Wagner, maintains an altitude for the first 3 miles but slightly below that of the main Siskiyou Range. The others drop off in elevation very soon after leaving the vicinity of the peak.

A large amount of water flows out of the reserve. Most of it flows into Rogue River through Applegate, Wagner, and Ashland creeks. Another and smaller portion finds its way into Klamath River through various small creeks on the southern slope of the peak. Ashland Creek heads directly on the northern slopes of Siskiyou Peak. Snow lies at its head throughout the year. It empties into Bear

Creek one-half mile east of the town of Ashland. In addition to supplying water to this town, it furnishes irrigation for a number of fruit ranches, supplies motive power to one sawmill and one electric-light plant located above the town, one gristmill, one woollen mill, and a 5-stamp quartz mill located in the city, besides water for a cyanide reduction plant. It serves also in part as the town sewer. All in all, the stream is very important to the town.

The reserve contains no proper agricultural lands; the summits of the low spurs in the eastern areas might possibly be utilized for orchard purposes if cleared. Most if not the entire area is gold bearing. Quartz ledges occur in many places on the slopes of Siskiyou Peak and placer deposits exist, in all probability, near the head of the creeks. No mining is carried on inside the reserve area. The summit and slopes of Siskiyou Peak and the high northern Mount Wagner spur are grassy in many places. Sheep range here, or did the year before last. True, most of their runs had been on the slopes shedding water into Applegate Creek and Klamath River, but some had left their marks on the Ashland side. If the purity and stability of the water volume in Ashland Creek is worthy of consideration, the prohibition of sheep grazing within the reserve area should be absolute. A band of sheep confined to such a limited tract as the grazing area in Ashland Reserve soon makes the ground reek with most pestiferous exhalations, which can not but find their way into the running water.

The forest consists of stands of alpine-hemlock, red-fir, and yellow-pine types. The alpine-hemlock type occurs on the summit of the peak, and is composed almost wholly of noble fir. The others have the ordinary composition of their respective types elsewhere.

Fires have marked most of the forest, but have not burned in the reserve within the last ten or twelve years to any great extent, except on the summit of the range, at the base of the peak, where the timber on 300 or 400 acres has been almost totally destroyed.

The mill timber in the reserve is of good quality, except in the eastern portion, where fires, years ago, badly seared the most of it. It is generally difficult of access for logging operations. But whether easy or difficult of access, it is obvious that the maintenance of the Ashland Creek water volume is prohibitive to lumbering operations in the reserve.

The areal and timber estimates are as follows:

<i>Forested and other areas in Ashland Forest Reserve, Oregon.</i>		Acres.
Area forested.....	.....	20,000
Area naturally nonforested.....	.....	1,700
Area deforested by fires of modern date.....	.....	300

Total stand of mill timber in Ashland Forest Reserve, Oregon.

	Feet B. M.
Yellow pine.....	30,000,000
Sugar pine.....	12,000,000
Red fir.....	100,000,000
White fir.....	" 6,000,000
Noble fir.....	50,000,000
Incense cedar.....	2,000,000
	200,000,000

SUMMARY OF AREAL AND TIMBER ESTIMATES.**SUMMARY OF CASCADE RANGE FOREST RESERVE, OREGON.***Area examined in the Cascade Range Forest Reserve, Oregon.*

	Acres.
Area nonforested.....	210,780
Area forested.....	627,620
Total.....	838,400
Area badly burned.....	305,120

Total stand of mill timber in Cascade Range Forest Reserve, Oregon.

	Feet B. M.
Yellow pine.....	625,903,800
Sugar pine.....	84,617,300
White pine.....	100,370,500
Red fir.....	1,952,338,600
White fir.....	567,553,600
Noble fir.....	692,324,400
Incense cedar.....	7,393,600
Alpine hemlock.....	590,699,800
Western hemlock.....	20,938,200
Engelmann spruce.....	68,969,400
Total.....	4,711,109,200
Average stand of mill timber per forested acre, 7,506.	

Areas classed as "badly burned" consist of tracts on which the forest has been burned from 75 per cent and upward by fires whose origin lie within the time of the white man's occupancy of the region. Seventy per cent of the areas thus devastated by fire are covered with brush growths or, to a lesser extent, with low-growing mountain sedges, the "grass" of the sheep ranges, of low nutritive value. The latter tracts are slowly reforesting; the former are not. The tracts marked by fires during the past forty or forty-five years comprise in the aggregate 820,000 acres.

Nonforested tracts include areas naturally nonforested and such as have been deforested by fire. Forested areas include veteran, standard, and young growth stands, together with reforestations advanced to sapling stage and thinly wooded subalpine areas.

Areal and timber estimates of the Cascade Range Forest Reserve, Oregon.

T.	R.	Non-forested.	Forested.	Badly burned.	Yellow pine.	Sugar pine.	White pine.
		<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
28 S..	5 E..	-----	23,040	18,000	-----	-----	5,000,000
28 S..	6 E..	5,040	18,000	15,000	-----	-----	-----
28 S..	6½ E..	-----	16,000	8,500	80,000,000	-----	-----
29 S..	3 E..	-----	23,040	10,000	-----	-----	4,000,000
29 S..	4 E..	-----	23,040	18,000	-----	-----	5,000,000
29 S..	5 E..	-----	23,040	18,000	-----	-----	-----
30 S..	1 E..	-----	23,040	2,500	59,685,000	7,958,000	-----
30 S..	2 E..	2,000	21,040	3,500	25,654,400	16,896,000	3,379,200
30 S..	3 E..	3,360	19,680	6,000	9,348,000	11,686,000	4,674,000
30 S..	4 E..	3,300	19,740	3,300	4,309,200	1,077,300	1,077,300
30 S..	5 E..	10,180	12,860	6,500	1,300,000	700,000	-----
30 S..	6 E..	17,960	5,080	2,500	-----	-----	-----
30 S..	6½ E..	2,000	21,040	5,000	52,000,000	-----	-----
31 S..	1 E..	-----	23,040	7,000	16,500,000	3,000,000	-----
31 S..	2 E..	-----	23,040	8,500	23,467,200	9,850,000	-----
31 S..	3 E..	12,160	10,880	15,000	8,000,000	9,000,000	1,000,000
31 S..	4 E..	8,320	14,720	8,320	1,000,000	1,000,000	6,000,000
31 S..	5 E..	2,560	20,480	4,000	200,000	-----	-----
31 S..	6 E..	1,600	21,440	4,000	-----	-----	5,000,000
32 S..	4 E..	13,000	10,040	13,000	-----	-----	5,000,000
32 S..	5 E..	11,600	11,440	11,000	-----	-----	1,900,000
32 S..	6 E..	2,600	20,440	5,000	65,000,000	-----	3,000,000
33 S..	4 E..	9,900	13,140	11,000	1,000,000	6,500,000	-----
33 S..	5 E..	6,500	16,540	9,500	-----	-----	-----
33 S..	6 E..	10,100	12,940	8,000	8,000,000	3,000,000	2,000,000
34 S..	4 E..	7,700	15,340	8,000	6,500,000	-----	-----
34 S..	5 E..	3,900	19,140	8,500	-----	-----	-----
34 S..	6 E..	9,600	13,440	4,000	20,000,000	-----	1,540,000
35 S..	4 E..	10,800	12,240	12,000	69,000,000	-----	-----
35 S..	5 E..	6,400	16,640	8,000	-----	-----	-----
35 S..	6 E..	6,300	16,740	5,000	38,000,000	2,650,000	500,000
36 S..	4 E..	7,000	16,040	3,500	10,000,000	2,000,000	8,500,000
36 S..	5 E..	10,200	12,840	12,000	3,000,000	-----	12,000,000
36 S..	6 E..	7,200	15,840	5,500	110,000,000	8,300,000	-----
37 S..	4 E..	4,100	18,940	4,500	940,000	-----	18,000,000
37 S..	5 E..	6,400	16,640	7,000	2,000,000	-----	12,000,000
37 S..	6 E..	9,000	14,040	6,000	11,000,000	1,000,000	800,000

FOREST RESERVES.

Areal and timber estimates of the Cascade Range Forest Reserve, Oregon—Continued.

T.	R.	Red fir.	White fir.	Noble fir.	Incense cedar.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
28 S.	5 E.	-----	-----	25,000,000	-----
28 S.	6 E.	-----	-----	3,000,000	-----
28 S.	6½ E.	-----	-----	-----	-----
29 S.	3 E.	40,000,000	10,000,000	-----	-----
29 S.	4 E.	10,000,000	10,000,000	-----	-----
29 S.	5 E.	-----	-----	-----	-----
30 S.	1 E.	250,677,000	7,958,000	39,790,000	-----
30 S.	2 E.	209,889,600	3,379,200	41,550,400	1,689,600
30 S.	3 E.	140,232,000	23,372,000	35,058,000	700,000
30 S.	4 E.	150,822,000	30,164,400	21,546,000	-----
30 S.	5 E.	5,000,000	-----	4,000,000	-----
30 S.	6 E.	-----	-----	3,000,000	-----
30 S.	6½ E.	-----	3,000,000	5,600,000	-----
31 S.	1 E.	160,000,000	8,000,000	11,000,000	620,000
31 S.	2 E.	205,338,000	6,000,000	14,000,000	1,684,000
31 S.	3 E.	150,000,000	12,000,000	2,000,000	-----
31 S.	4 E.	4,200,000	-----	98,000,000	600,000
31 S.	5 E.	680,000	-----	20,000,000	-----
31 S.	6 E.	-----	5,000,000	15,000,000	-----
32 S.	4 E.	-----	-----	90,000,000	-----
32 S.	5 E.	-----	-----	14,000,000	-----
32 S.	6 E.	-----	30,000,000	1,480,000	-----
33 S.	4 E.	108,000,000	12,480,000	-----	-----
33 S.	5 E.	-----	-----	14,300,000	-----
33 S.	6 E.	1,000,000	10,000,000	5,000,000	-----
34 S.	4 E.	13,000,000	2,800,000	25,000,000	-----
34 S.	5 E.	-----	-----	10,000,000	-----
34 S.	6 E.	8,500,000	38,000,000	25,000,000	-----
35 S.	4 E.	42,000,000	2,750,000	15,000,000	-----
35 S.	5 E.	-----	6,450,000	14,000,000	-----
35 S.	6 E.	20,000,000	30,000,000	15,000,000	-----
36 S.	4 E.	148,000,000	27,000,000	37,000,000	-----
36 S.	5 E.	36,000,000	60,700,000	13,000,000	-----
36 S.	6 E.	35,000,000	20,000,000	-----	2,100,000
37 S.	4 E.	180,000,000	48,500,000	26,000,000	-----
37 S.	5 E.	30,000,000	120,000,000	16,000,000	-----
37 S.	6 E.	4,000,000	40,000,000	33,000,000	-----

Areal and timber estimates of the Cascade Range Forest Reserve, Oregon—Continued.

T.	R.	Alpine hemlock.	Western hemlock.	Engelmann spruce.	Total.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
28 S.	5 E.	10,000,000	-----	-----	40,000,000
28 S.	6 E.	2,000,000	-----	-----	5,000,000
28 S.	6½ E.	-----	-----	-----	80,000,000
29 S.	3 E.	11,000,000	-----	-----	65,000,000
29 S.	4 E.	-----	-----	-----	25,000,000
29 S.	5 E.	-----	-----	-----	-----
30 S.	1 E.	31,832,000	-----	-----	397,900,000
30 S.	2 E.	33,792,000	1,689,600	-----	337,920,000
30 S.	3 E.	7,012,000	1,168,600	469,400	233,720,000
30 S.	4 E.	6,463,800	-----	-----	215,460,000
30 S.	5 E.	14,040,000	-----	-----	25,040,000
30 S.	6 E.	10,000,000	-----	440,000	13,440,000
30 S.	6½ E.	7,000,000	-----	-----	67,600,000
31 S.	1 E.	14,000,000	-----	-----	213,120,000
31 S.	2 E.	33,000,000	-----	-----	293,339,200
31 S.	3 E.	1,200,000	480,000	-----	183,680,000
31 S.	4 E.	13,400,000	8,000,000	-----	132,200,000
31 S.	5 E.	36,000,000	-----	-----	56,880,000
31 S.	6 E.	25,000,000	-----	520,000	50,520,000
32 S.	4 E.	7,960,000	3,000,000	-----	105,960,000
32 S.	5 E.	52,000,000	600,000	460,000	68,960,000
32 S.	6 E.	10,000,000	-----	-----	109,480,000
33 S.	4 E.	-----	-----	-----	127,980,000
33 S.	5 E.	108,000,000	-----	2,000,000	124,300,000
33 S.	6 E.	23,000,000	-----	400,000	52,400,000
34 S.	4 E.	40,000,000	-----	21,000,000	108,300,000
34 S.	5 E.	17,000,000	-----	4,280,000	31,280,000
34 S.	6 E.	9,000,000	-----	8,000,000	110,040,000
35 S.	4 E.	6,000,000	-----	-----	134,750,000
35 S.	5 E.	15,000,000	-----	17,000,000	52,450,000
35 S.	6 E.	6,000,000	-----	500,000	112,650,000
36 S.	4 E.	13,000,000	1,500,000	1,000,000	248,000,000
36 S.	5 E.	10,000,000	2,000,000	3,000,000	139,700,000
36 S.	6 E.	-----	-----	-----	175,400,000
37 S.	4 E.	-----	-----	3,500,000	276,940,000
37 S.	5 E.	3,000,000	2,500,000	400,000	185,900,000
37 S.	6 E.	15,000,000	-----	6,000,000	110,800,000

SUMMARY OF AREAL AND TIMBER ESTIMATES FOR ENTIRE
REGION EXAMINED.*Forested and other areas in region examined.*

	Acres.
Forested area	2,998,440
Nonforested area.....	1,677,920
Total	4,676,360

Amount of timber examined and estimated.

	Feet B. M.
Yellow pine	9,477,520,400
Sugar pine.....	813,902,100
White pine	130,470,500
Red fir.....	6,638,264,800
White fir	1,215,526,000
Noble fir.....	885,824,400
Incense cedar	91,393,600
Alpine hemlock	609,619,800
Western hemlock	46,718,200
Engelmann spruce.....	71,969,400
Total	19,981,209,200

Average of mill timber per forested acre, 6,664.

These estimates are based upon dimensions down to 8 inches basal diameter and 10 feet of clear trunk. Close and economical lumbering methods utilizing portions of the crown would add 15 per cent to above timber estimates.

The rather low average per forested acre is due to the occurrence on the summit and eastern slope of the Cascades of large forested areas covered with a nearly pure growth of lodgepole pine or in some localities at high elevations of tracts with stands of scrubby alpine hemlock. Areas of these kinds carry no mill timber.

The large tracts of nonforested lands in the region are due to: (1) semiarid valleys occurring not only on the eastern slope of the Cascades where the annual precipitation is low, but also on the western declivities of the range; (2) large brush-covered areas on the summit and western slopes of the Cascades and on the summit and northern and southern slopes of the Siskiyou. They are the result of extensive fires destroying the timber and nonreforestation. Considerable tracts also are covered by the large Klamath lakes and their borders of grass and tule lands.

Areal and timber estimates, by townships, of region examined.

T.	R.	Nonfor- ested	Forested.	Yellow pine.	Sugar pine.	White pine.
		Acres.	Acres.	Est. B. M.	Est. B. M.	Est. B. M.
28 S.	5 E.		23,040			5,000,000
28 S.	6 E.	5,040	18,000			
28 S.	6½ E.		23,040	161,280,000		
28 S.	7 E.		23,040	26,880,000		
28 S.	8 E.		23,040	1,500,000		
29 S.	3 E.		23,040			4,000,000
29 S.	4 E.		23,040			5,000,000
29 S.	5 E.		23,040			
29 S.	7 E.		23,040	80,640,000		
29 S.	8 E.	3,040	20,000	6,000,000		
30 S.	1 E.		23,040	50,685,000	7,958,000	
30 S.	2 E.	2,000	21,040	25,654,400	16,890,000	3,379,200
30 S.	3 E.	3,360	19,680	9,348,000	11,680,000	4,674,000
30 S.	4 E.	3,300	19,740	4,309,200	1,077,300	1,077,300
30 S.	5 E.	10,180	12,860	1,300,000	700,000	
30 S.	6 E.	17,960	5,080			
30 S.	6½ E.	2,000	21,040	52,000,000		
30 S.	7 E.	18,560	4,480	33,600,000		
30 S.	8 E.	5,760	17,280	2,240,000		
30 S.	9 E.	16,640	6,400	26,240,000		
30 S.	10 E.	11,240	11,800	122,700,000		
30 S.	11 E.	7,700	15,340	93,700,000		
30 S.	12 E.	12,000	11,040	35,000,000		
30 S.	13 E.	15,000	8,040	16,000,000		
30 S.	14 E.	13,000	10,040	8,000,000		
31 S.	1 W.		23,040	85,000,000	10,000,000	
31 S.	1 E.		23,040	16,500,000	3,000,000	
31 S.	2 E.		23,040	23,467,200	9,850,000	
31 S.	3 E.	12,160	10,880	8,000,000	9,000,000	1,000,000
31 S.	4 E.	8,320	14,720	1,000,000	1,000,000	6,000,000
31 S.	5 E.	2,560	20,480	200,000		
31 S.	6 E.	1,600	21,440			5,000,000
31 S.	6½ E.	2,000	21,040	65,000,000		
31 S.	7 E.	3,040	20,000	71,500,000		
31 S.	8 E.	17,400	5,640			
31 S.	9 E.	8,300	14,740	76,160,000		
31 S.	10 E.		23,040	220,800,000		
31 S.	11 E.	3,900	19,140	200,000,000		

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Red fir.	White fir.	Noble fir.	Incense cedar.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
28 T.	5 E.			25,000,000	
28 S.	6 E.			3,000,000	
28 T.	6½ E.				
28 T.	7 E.				
28 T.	8 E.				
29 T.	3 E.	40,000,000	10,000,000		
29 T.	4 E.	10,000,000	10,000,000		
29 T.	5 E.				
29 T.	7 E.				
29 T.	8 E.				
30 S.	1 E.	250,677,000	7,958,000	39,790,000	
30 S.	2 E.	209,889,600	3,379,200	41,550,400	1,689,600
30 S.	3 E.	140,232,000	23,372,000	35,058,000	700,000
30 S.	4 E.	150,822,000	30,164,400	21,546,000	
30 S.	5 E.	5,000,000		4,000,000	
30 T.	6 E.			3,000,000	
30 S.	6½ E.		3,000,000	5,600,000	
30 S.	7 E.				
30 S.	8 E.				
30 S.	9 E.				
30 T.	10 E.				
30 T.	11 E.		3,740,000		
30 T.	12 E.				
30 T.	13 E.				
30 T.	14 E.				
31 S.	1 W.	175,000,000	25,000,000		5,000,000
31 S.	1 E.	160,000,000	8,000,000	11,000,000	620,000
31 S.	2 E.	205,338,000	6,900,900	14,000,000	1,684,000
31 S.	3 E.	150,000,000	12,900,000	2,000,000	
31 S.	4 E.	4,200,000		98,000,000	600,000
31 S.	5 E.			20,000,000	
31 T.	6 E.		5,000,000	15,000,000	
31 S.	6½ E.		1,000,000	5,000,000	
31 T.	7 E.		500,000		
31 T.	8 E.				
31 T.	9 E.				
31 T.	10 E.				
31 S.	11 E.		2,900,000		

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Alpine hemlock.	Western hemlock.	Engelmann spruce.	Total.
		<i>Fct B. M.</i>	<i>Fct B. M.</i>	<i>Fct B. M.</i>	<i>Fct B. M.</i>
28 S.	5 E.	10,000,000			40,000,000
28 S.	6 E.	2,000,000			5,000,000
28 S.	6½ E.				161,280,000
28 S.	7 E.				26,880,000
28 S.	8 E.				1,500,000
29 S.	3 E.	11,000,000			65,000,000
29 S.	4 E.				25,000,000
29 S.	5 E.				
29 S.	7 E.				80,640,000
29 S.	8 E.				6,000,000
30 S.	1 E.	31,832,000			397,900,000
30 S.	2 E.	33,792,000	1,689,600		337,920,000
30 S.	3 E.	7,012,000	1,168,600	469,400	233,720,000
30 S.	4 E.	6,463,800			215,460,000
30 S.	5 E.	14,040,000			25,040,000
30 S.	6 E.	10,000,000		440,000	13,440,000
30 S.	6½ E.	7,000,000			67,600,000
30 S.	7 E.				33,600,000
30 S.	8 E.				2,240,000
30 S.	9 E.				26,240,000
30 S.	10 E.				122,700,000
30 S.	11 E.				97,440,000
30 S.	12 E.				35,000,000
30 S.	13 E.				16,000,000
30 S.	14 E.				8,000,000
31 S.	1 W.				300,000,000
31 S.	1 E.	14,000,000			213,120,000
31 S.	2 E.	33,000,000			293,339,200
31 S.	3 E.	1,200,000	480,000		183,680,000
31 S.	4 E.	13,400,000	8,000,000		132,200,000
31 S.	5 E.	36,000,000			56,880,000
31 S.	6 E.	25,000,000		520,000	50,520,000
31 S.	6½ E.	27,920,000			98,920,000
31 S.	7 E.				72,000,000
31 S.	8 E.				
31 S.	9 E.				76,160,000
31 S.	10 E.				220,800,000
31 S.	11 E.				202,900,000

FOREST RESERVES.

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Non-forested.	Forested.	Yellow pine.	Sugar pine.	White pine.
		<i>Acres.</i>	<i>Acres.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
31 N	12 E	8,000	15,040	25,000,000		
31 S	13 E	12,000	11,040	12,000,000		
31 S	14 E	12,000	11,040	48,000,000		
32 S	2 W	600	22,440	15,000,000	6,000,000	
32 S	1 W	1,200	21,840	30,000,000	8,000,000	
32 S	1 E		23,040	48,000,000	800,000	
32 S	2 E	4,500	18,540	54,000,000	6,000,000	
32 S	3 E	5,100	17,940	45,000,000	100,000,000	6,000,000
32 S	4 E	13,000	10,040			5,000,000
32 S	5 E	11,600	11,440			1,900,000
32 S	6 E	2,600	20,440	65,000,000		3,000,000
32 S	7½ E	6,400	16,640	65,000,000	5,000,000	
32 S	7 E	2,000	20,540	160,480,000	9,440,000	
32 S	8 E	4,800	18,240	34,560,000		
32 S	9 E	9,040	14,000	98,000,000		
32 S	10 E	3,000	23,040	154,800,000		
32 S	11 E	7,700	15,340	88,000,000		
32 S	12 E		23,040	197,800,000		
32 S	13 E	9,000	14,040	91,500,000		
32 S	14 E	10,000	13,040	32,000,000		
33 S	2 W	1,000	22,040	40,000,000		
33 S	1 W	2,800	20,240	60,000,000	3,000,000	
33 S	1 E	4,400	18,640	20,520,000	3,000,000	
33 S	2 E	2,500	20,540	24,000,000	4,600,000	
33 S	3 E	3,200	19,840	16,000,000	99,500,000	6,000,000
33 S	4 E	9,900	13,140	1,000,000	6,500,000	
33 S	5 E	6,500	16,540			
33 S	6 E	10,100	12,940	8,000,000	3,000,000	2,000,000
33 S	7½ E	14,000	9,040	29,000,000	5,000,000	
33 S	7 E	1,600	21,440	197,820,000	2,000,000	
33 S	8 E	600	22,440	147,980,000		
33 S	9 E	6,100	16,940	101,800,000		
33 S	10 E	200	22,840	250,600,000		
33 S	11 E	1,300	21,740	131,800,000		
33 S	12 E	2,000	21,040	53,000,000		
33 S	13 E	7,000	16,040	24,000,000		
33 S	14 E	10,000	13,040	10,000,000		
34 S	2 W	2,000	21,040	16,000,000	1,500,000	
34 S	1 W	2,500	20,540	12,000,000		

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Red fir.	White fir.	Noble fir.	Incense cedar.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
31 T.	12 E.				
31 T.	13 E.				
31 T.	14 E.				
32 T.	2 W.	175,000,000	12,000,000		1,000,000
32 T.	1 W.	195,000,000	13,000,000		2,000,000
32 T.	1 E.	190,000,000	8,000,000		440,000
32 T.	2 E.	110,000,000	10,000,000		1,120,000
32 T.	3 E.	286,000,000	12,240,000		
32 T.	4 E.			90,000,000	
32 T.	5 E.			14,000,000	
32 T.	6 E.		30,000,000	1,480,000	
32 T.	7 $\frac{1}{2}$ E.		15,000,000		300,000
32 T.	7 E.		18,880,000		
32 T.	8 E.				
32 T.	9 E.				
32 T.	10 E.				
32 T.	11 E.				
32 T.	12 E.				
32 T.	13 E.				
32 T.	14 E.				
33 T.	2 W.	11,000,000			
33 T.	1 W.	47,000,000			
33 T.	1 E.	33,000,000	1,500,000		500,000
33 T.	2 E.	156,000,000	16,000,000		800,000
33 T.	3 E.	610,500,000	65,000,000		3,000,000
33 T.	4 E.	108,000,000	12,480,000		
33 T.	5 E.			14,300,000	
33 T.	6 E.	1,000,000	10,000,000	5,000,000	
33 T.	7 $\frac{1}{2}$ E.	100,000	7,450,000		850,000
33 T.	7 E.		4,000,000		500,000
33 T.	8 E.				
33 T.	9 E.				
33 T.	10 E.				
33 T.	11 E.				
33 T.	12 E.				
33 T.	13 E.				
33 T.	14 E.				
34 T.	2 W.	5,000,000			500,000
34 T.	1 W.	4,000,000			

FOREST RESERVES.

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Alpine hemlock.	Western hemlock.	Engelmann spruce.	Total.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
31 S.	12 E.				25,000,000
31 S.	13 E.				12,000,000
31 S.	14 E.				48,000,000
32 S.	2 W.				209,000,000
32 S.	1 W.				248,000,000
32 S.	1 E.				247,240,000
32 S.	2 E.				181,120,000
32 S.	3 E.		3,000,000		452,240,000
32 S.	4 E.	7,960,000	3,000,000		105,960,000
32 S.	5 E.	52,000,000	600,000	460,000	68,960,000
32 S.	6 E.	10,000,000			109,480,000
32 S.	7½ E.				85,300,000
32 S.	7 E.				188,800,000
32 S.	8 E.				34,560,000
32 S.	9 E.				98,000,000
32 S.	10 E.				154,800,000
32 S.	11 E.				88,000,000
32 S.	12 E.				197,800,000
32 S.	13 E.				91,500,000
32 S.	14 E.				32,000,000
33 S.	2 W.				51,000,000
33 S.	1 W.				110,000,000
33 S.	1 E.				58,520,000
33 S.	2 E.		2,400,000		203,800,000
33 S.	3 E.		6,880,000		806,880,000
33 S.	4 E.				127,980,000
33 S.	5 E.	108,000,000		2,000,000	124,300,000
33 S.	6 E.	23,000,000		400,000	52,400,000
33 S.	7½ E.				42,400,000
33 S.	7 E.				204,320,000
33 S.	8 E.				147,980,000
33 S.	9 E.				101,800,000
33 S.	10 E.				250,600,000
33 S.	11 E.				131,800,000
33 S.	12 E.				53,000,000
33 S.	13 E.				24,000,000
33 S.	14 E.				10,000,000
34 S.	2 W.				23,000,000
34 S.	1 W.				16,000,000

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Nonfor- ested.	Forested.	Yellow pine.	Sugar pine.	White pine.
		<i>Acres.</i>	<i>Acres.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
34 S....	1 E....	6,400	16,640	12,000,000	3,480,000	-----
34 S....	2 E....	3,800	19,240	34,000,000	12,000,000	-----
34 S....	3 E....	2,500	20,540	90,000,000	24,000,000	-----
34 S....	4 E....	7,700	15,340	6,500,000	-----	-----
34 S....	5 E....	3,900	19,140	-----	-----	-----
34 S....	6 E....	9,600	13,440	20,000,000	-----	1,540,000
34 S....	7½ E....	21,840	1,200	3,600,000	-----	-----
34 S....	7 E....	5,760	17,280	48,000,000	3,000,000	-----
34 S....	8 E....	10,880	12,160	28,400,000	700,000	-----
34 S....	9 E....	10,240	12,800	30,000,000	-----	-----
34 S....	10 E....	-----	23,040	70,000,000	-----	-----
34 S....	11 E....	8,000	15,040	77,300,000	-----	-----
34 S....	12 E....	9,200	13,840	94,000,000	700,000	-----
34 S....	13 E....	-----	23,040	147,000,000	3,000,000	-----
34 S....	14 E....	8,000	15,040	40,000,000	1,500,000	-----
35 S....	2 W....	20,040	3,000	1,600,000	-----	-----
35 S....	1 W....	18,040	5,000	3,000,000	-----	-----
35 S....	1 E....	12,800	10,240	14,000,000	-----	-----
35 S....	2 E....	3,200	19,840	28,000,000	4,500,000	-----
35 S....	3 E....	3,000	20,040	160,000,000	11,000,000	-----
35 S....	4 E....	10,800	12,240	69,000,000	-----	-----
35 S....	5 E....	6,400	16,640	-----	-----	-----
35 S....	6 E....	6,300	16,740	38,000,000	2,650,000	500,000
35 S....	7½ E....	23,040	-----	-----	-----	-----
35 S....	7 E....	7,680	15,360	40,320,000	-----	-----
35 S....	8 E....	-----	23,040	59,296,600	2,764,800	-----
35 S....	9 E....	7,700	15,340	73,000,000	1,000,000	-----
35 S....	10 E....	10,880	12,160	6,000,000	-----	-----
35 S....	11 E....	16,700	6,340	3,200,000	-----	-----
35 S....	12 E....	18,800	4,240	17,300,000	-----	-----
35 S....	13 E....	6,100	16,940	48,000,000	3,000,000	-----
35 S....	14 E....	15,000	8,040	22,000,000	-----	-----
36 S....	2 W....	18,840	4,200	2,300,000	-----	-----
36 S....	1 W....	18,040	5,000	2,700,000	-----	-----
36 S....	1 E....	13,640	9,400	4,800,000	-----	-----
36 S....	2 E....	7,000	16,040	12,000,000	3,000,000	-----
36 S....	3 E....	3,600	19,440	50,000,000	4,500,000	6,000,000
36 S....	4 E....	7,000	16,040	10,000,000	2,000,000	8,500,000
36 S....	5 E....	10,200	12,840	3,000,000	-----	12,000,000

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Red fir.	White fir.	Noble fir.	Incense cedar.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
34 S.	1 E.	15,410,000	3,910,000		
34 S.	2 E.	118,000,000	10,000,000		1,690,000
34 S.	3 E.	234,000,000	38,000,000		5,360,000
34 S.	4 E.	13,000,000	2,800,000	25,000,000	
34 S.	5 E.			10,000,000	
34 S.	6 E.	8,500,000	38,000,000	25,000,000	
34 S.	7½ E.				
34 S.	7 E.		2,000,000		240,000
34 S.	8 E.		1,300,000		
34 S.	9 E.				
34 S.	10 E.				
34 S.	11 E.		1,700,000		
34 S.	12 E.		1,200,000		100,000
34 S.	13 E.		17,000,000		1,000,000
34 S.	14 E.		8,000,000		500,000
35 S.	2 W.	700,000			
35 S.	1 W.	1,000,000			
35 S.	1 E.	8,000,000	2,000,000		
35 S.	2 E.	98,000,000	11,000,000		3,600,000
35 S.	3 E.	109,000,000	12,000,000		3,000,000
35 S.	4 E.	42,000,000	2,750,000	15,000,000	
35 S.	5 E.		6,450,000	14,000,000	
35 S.	6 E.	20,000,000	30,000,000	15,000,000	
35 S.	7½ E.				
35 S.	7 E.				
35 S.	8 E.	5,776,200	1,382,400		
35 S.	9 E.	4,000,000	2,000,000		
35 S.	10 E.				
35 S.	11 E.				
35 S.	12 E.				
35 S.	13 E.		6,000,000		600,000
35 S.	14 E.		6,000,000		
36 S.	2 W.	200,000			
36 S.	1 W.	300,000			
36 S.	1 E.	500,000			
36 S.	2 E.	22,000,000	3,000,000		1,000,000
36 S.	3 E.	160,000,000	25,000,000	10,500,000	2,500,000
36 S.	4 E.	148,000,000	27,000,000	37,000,000	
36 S.	5 E.	36,000,000	60,700,000	13,000,000	

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Alpine hemlock.	Western hemlock.	Engelmann spruce.	Total.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
34 T.	1 E.				34,800,000
34 T.	2 E.		1,000,000		176,690,000
34 T.	3 E.		1,000,000		392,360,000
34 T.	4 E.	40,000,000		21,000,000	108,300,000
34 T.	5 E.	17,000,000		4,280,000	31,280,000
34 T.	6 E.	9,000,000		8,000,000	110,040,000
34 T.	7 E.				3,600,000
34 S.	7 E.				53,240,000
34 T.	8 E.				30,400,000
34 T.	9 E.				30,000,000
34 T.	10 E.				70,000,000
34 T.	11 E.				79,000,000
34 T.	12 E.				96,000,000
34 T.	13 E.				168,000,000
34 T.	14 E.				50,000,000
35 T.	2 W.				2,300,000
35 T.	1 W.				4,000,000
35 T.	1 E.				24,000,000
35 T.	2 E.				145,100,000
35 T.	3 E.				295,000,000
35 S.	4 E.	6,000,000			134,750,000
35 T.	5 E.	15,000,000		17,000,000	52,450,000
35 T.	6 E.	6,000,000		500,000	112,650,000
35 T.	7 E.				40,320,000
35 T.	8 E.				69,220,000
35 T.	9 E.				80,000,000
35 T.	10 E.				6,000,000
35 T.	11 E.				3,200,000
35 T.	12 E.				17,300,000
35 T.	13 E.				57,600,000
35 T.	14 E.				28,000,000
36 T.	2 W.				2,500,000
36 T.	1 W.				3,000,000
36 T.	1 E.				5,300,000
36 T.	2 E.				41,000,000
36 T.	3 E.				258,500,000
36 T.	4 E.	13,000,000	1,500,000	1,000,000	248,000,000
36 T.	5 E.	10,000,000	2,000,000	3,000,000	139,700,000

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Nonfor- ested.	Forested.	Yellow pine.	Sugar pine.	White pine.
		<i>Acres.</i>	<i>Acres.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
36 S.	6 E.	7,200	15,840	110,000,000	8,300,000	
36 S.	7a E.	20,040	3,000	2,500,000		
36 S.	7b E.	15,760	7,280	21,640,000		
36 S.	8 E.		23,040	72,000,000	2,000,000	
36 S.	9 E.	1,200	21,840	110,500,000	1,300,000	
36 S.	10 E.	12,800	10,240	38,000,000		
36 S.	11 E.	15,360	7,680	64,000,000		
36 S.	12 E.	20,540	2,500	2,500,000		
36 S.	13 E.	7,000	16,040	113,000,000		
36 S.	14 E.	15,000	8,040	8,000,000		
37 S.	2 W.	20,640	2,400	800,000		
37 S.	1 W.	13,500	9,540	9,000,000	1,000,000	
37 S.	1 E.	1,900	21,140	18,000,000	500,000	
37 S.	2 E.	3,000	20,040	35,000,000	1,700,000	
37 S.	3 E.	3,500	19,540	54,000,000	5,600,000	
37 S.	4 E.	4,100	18,940	940,000		18,000,000
37 S.	5 E.	6,400	16,640	2,000,000		12,000,000
37 S.	6 E.	9,000	14,040	11,000,000	1,000,000	800,000
37 S.	7 E.	3,900	19,140	135,800,000		
37 S.	8 E.	22,340	700	1,400,000		
37 S.	9 E.	12,160	10,880	40,320,000		
37 S.	10 E.	16,160	6,880	32,000,000	400,000	
37 S.	11½ E.	14,720	8,320	18,500,000		
37 S.	11 E.	3,840	19,200	57,600,000		
37 S.	12 E.	2,900	20,140	94,000,000		
37 S.	13 E.	2,600	20,440	95,000,000		
37 S.	14 E.	6,000	17,040	42,000,000		
38 S.	2 W.	5,200	17,840	30,000,000		
38 S.	1 W.	23,040				
38 S.	1 E.	11,600	11,440	22,000,000		
38 S.	2 E.	11,000	12,040	11,000,000		
38 S.	3 E.	5,700	17,340	55,000,000	3,000,000	
38 S.	4 E.	5,700	17,340	44,000,000	8,000,000	5,900,000
38 S.	5 E.	6,000	17,040	45,000,000	2,000,000	1,200,000
38 S.	6 E.	3,600	19,440	64,000,000	22,000,000	3,000,000
38 S.	7 E.	4,500	18,540	118,000,000		
38 S.	8 E.	17,280	5,760	14,300,000		
38 S.	9 E.	17,280	5,760	11,520,000		
38 S.	10 E.	12,160	10,880	22,000,000		

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Red fir.	White fir.	Noble fir.	Incense cedar.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
36 S	6 E	35,000,000	20,000,000		2,100,000
36 S	7a E	500,000			
36 S	7b E				
36 S	8 E	4,000,000	5,000,000		1,280,000
36 S	9 E	12,200,000	9,500,000		2,500,000
36 S	10 E		2,000,000		500,000
36 S	11 E		2,200,000		300,000
36 S	12 E		300,000		
36 S	13 E				
36 S	14 E				
37 S	2 W	400,000			
37 S	1 W	15,000,000	5,000,000		400,000
37 S	1 E	12,000,000	1,500,000		
37 S	2 E	60,000,000	4,000,000		
37 S	3 E	130,000,000	4,000,000		
37 S	4 E	180,000,000	48,500,000	26,000,000	
37 S	5 E	30,000,000	120,000,000	16,000,000	
37 S	6 E	4,000,000	40,000,000	33,000,000	
37 S	7 E	10,000,000	24,000,000		
37 S	8 E				
37 S	9 E				
37 S	10 E	5,000,000	5,000,000		700,000
37 S	11½ E				
37 S	11 E				
37 S	12 E		6,000,000		
37 S	13 E				
37 S	14 E		10,000,000		
38 S	2 W	10,000,000			
38 S	1 W				
38 S	1 E	1,600,000			
38 S	2 E	33,000,000	3,000,000	1,000,000	
38 S	3 E	92,000,000	4,880,000		2,000,000
38 S	4 E	145,000,000	20,000,000	25,000,000	
38 S	5 E	90,000,000	4,000,000	13,000,000	300,000
38 S	6 E	103,000,000	6,000,000	15,000,000	
38 S	7 E	57,000,000	15,700,000		
38 S	8 E	3,500,000	3,960,000		
38 S	9 E				
38 S	10 E				

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Alpine hemlock.	Western hemlock.	Engelmann spruce.	Total.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
36 S.	6 E.				175,400,000
36 S.	7a E.				3,000,000
36 S.	7b E.				21,640,000
36 S.	8 E.				84,280,000
36 S.	9 E.				136,000,000
36 S.	10 E.				40,500,000
36 S.	11 E.				66,500,000
36 S.	12 E.				2,800,000
36 S.	13 E.				113,000,000
37 S.	14 E.				8,000,000
37 S.	2 W.				1,200,000
37 S.	1 W.				30,400,000
37 S.	1 E.				32,000,000
37 S.	2 E.				100,700,000
37 S.	3 E.				193,600,000
37 S.	4 E.			3,500,000	276,940,000
37 S.	5 E.	3,000,000	2,500,000	400,000	185,900,000
37 S.	6 E.	15,000,000		6,000,000	110,800,000
37 S.	7 E.				169,800,000
37 S.	8 E.				1,400,000
37 S.	9 E.				40,320,000
37 S.	10 E.				43,100,000
37 S.	11½ E.				18,500,000
37 S.	11 E.				57,600,000
37 S.	12 E.				100,000,000
37 S.	13 E.				95,000,000
37 S.	14 E.				52,000,000
38 S.	2 W.				30,000,000
38 S.	1 W.				
38 S.	1 E.				23,600,000
38 S.	2 E.				48,000,000
38 S.	3 E.				156,880,000
38 S.	4 E.				247,900,000
38 S.	5 E.		500,000		156,000,000
38 S.	6 E.	2,000,000		3,000,000	218,000,000
38 S.	7 E.				190,700,000
38 S.	8 E.				21,760,000
38 S.	9 E.				11,520,000
38 S.	10 E.				22,000,000

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Nonfor- ested.	Forested.	Yellow pine.	Sugar pine.	White pine.
		<i>Acres.</i>	<i>Acres.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
38 T	11½ E	21,400	1,640	2,240,000		
38 S	11 E	9,000	14,040	53,000,000		
38 T	12 E	5,800	17,240	84,000,000		
38 S	13 E	9,900	13,140	38,000,000		
38 T	14 E	14,000	9,040	8,000,000		
39 T	2 W	14,000	9,040	29,000,000		
39 T	1 W	5,800	17,240	73,000,000	9,000,000	
39 T	1 E	15,000	8,040	22,000,000	7,000,000	
39 T	2 E	12,500	10,540	7,000,000		
39 T	3 E	3,900	19,140	65,000,000	10,000,000	
39 T	4 E	5,000	18,040	122,000,000	31,000,000	
39 T	5 E	1,900	21,140	188,000,000	28,000,000	
39 T	6 E	4,200	18,840	60,000,000	15,000,000	
39 T	7 E	5,000	18,040	70,000,000	3,000,000	
39 T	8 E	14,720	8,320	10,880,000		
39 T	9 E	23,040				
39 T	10 E	18,500	4,540	10,000,000		
39 T	11½ E	15,360	7,680	22,500,000		
39 T	11 E	7,600	15,440	85,000,000		
39 T	12 E	15,400	7,640	42,000,000		
39 T	13 E	18,600	4,440	22,000,000		
39 T	14 E	15,000	8,040	8,000,000		
40 T	2 W	3,800	19,240	60,000,000	5,000,000	
40 T	1 W	6,000	17,040	26,000,000	8,000,000	1,000,000
40 T	1 E	4,500	18,540	36,000,000	16,000,000	
40 T	2 E	9,500	13,540	15,000,000	2,000,000	
40 T	3 E	11,000	12,040	16,000,000	2,000,000	
40 T	4 E	3,300	19,740	132,000,000	35,000,000	
40 T	5 E	2,600	20,440	170,000,000	60,000,000	
40 T	6 E	1,800	21,240	190,000,000	45,000,000	
40 T	7 E	1,300	21,740	175,000,000	8,000,000	
40 T	8 E	16,900	6,140	40,000,000		
40 T	9 E	23,040				
40 T	10 E	16,000	7,040	42,000,000		
40 T	11 E	18,000	5,040	5,000,000		
40 T	12 E	12,000	11,040	50,000,000		
40 T	13 E	12,800	10,240	50,000,000		
40 S	14 E	19,800	3,240	15,000,000		
40 S	14½ E	10,000	13,040	45,000,000		

FOREST RESERVES.

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Red fir.	White fir.	Noble fir.	Incense cedar.
		<i>Fect B. M.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
38 S.	11½ E.				
38 S.	11 E.	5,000,000	4,000,000		
38 S.	12 E.		2,000,000		500,000
38 S.	13 E.		4,000,000		2,000,000
38 S.	14 E.				
39 S.	2 W.	6,000,000			
39 S.	1 W.	21,000,000			
39 S.	1 E.	6,000,000			
39 S.	2 E.	3,000,000			
39 S.	3 E.	55,000,000	6,300,000		
39 S.	4 E.	80,000,000	4,000,000		2,850,000
39 S.	5 E.	95,000,000	10,000,000	4,000,000	3,000,000
39 S.	6 E.	105,000,000	15,000,000		800,000
39 S.	7 E.	15,000,000	7,000,000		900,000
39 S.	8 E.				
39 S.	9 E.				
39 S.	10 E.				
39 S.	11½ E.				
39 S.	11 E.		5,000,000		
39 S.	12 E.		4,000,000		
39 S.	13 E.				
39 S.	14 E.				
40 S.	2 W.	45,000,000		7,000,000	2,000,000
40 S.	1 W.	55,000,000	3,000,000	14,000,000	3,000,000
40 S.	1 E.	50,000,000	8,000,000	50,000,000	4,000,000
40 S.	2 E.	45,000,000	2,000,000	4,000,000	
40 S.	3 E.	51,200,000			400,000
40 S.	4 E.	70,000,000	10,000,000		1,000,000
40 S.	5 E.	100,000,000	17,000,000		3,620,000
40 S.	6 E.	75,000,000	9,000,000		1,000,000
40 S.	7 E.	65,000,000			
40 S.	8 E.	9,000,000	3,980,000		
40 S.	9 E.				
40 S.	10 E.				
40 S.	11 E.				
40 S.	12 E.				
40 S.	13 E.	5,000,000	6,000,000		1,000,000
40 S.	14 E.				
40 S.	14½ E.				

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Alpine hemlock.	Western hemlock.	Engelmann spruce.	Total.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
38 S.	11½ E.				2,240,000
38 S.	11 E.				62,000,000
38 S.	12 E.				86,500,000
38 S.	13 E.				44,000,000
38 S.	14 E.				8,000,000
39 S.	2 W.				35,000,000
39 S.	1 W.				103,000,000
39 S.	1 E.				35,000,000
39 S.	2 E.				10,000,000
39 S.	3 E.				136,300,000
39 S.	4 E.				239,850,000
39 S.	5 E.				328,000,000
39 S.	6 E.				195,800,000
39 S.	7 E.				95,900,000
39 S.	8 E.				10,880,000
39 S.	9 E.				
39 S.	10 E.				10,000,000
39 S.	11½ E.				22,500,000
39 S.	11 E.				90,000,000
39 S.	12 E.				46,000,000
39 S.	13 E.				22,000,000
39 S.	14 E.				8,000,000
40 S.	2 W.				119,000,000
40 S.	1 W.				110,000,000
40 S.	1 E.				164,000,000
40 S.	2 E.				68,000,000
40 S.	3 E.				69,600,000
40 S.	4 E.				248,000,000
40 S.	5 E.				350,620,000
40 S.	6 E.				320,000,000
40 S.	7 E.				248,000,000
40 S.	8 E.				52,980,000
40 S.	9 E.				
40 S.	10 E.				42,000,000
40 S.	11 E.				5,000,000
40 S.	12 E.				50,000,000
40 S.	13 E.				62,000,000
40 S.	14 E.				15,000,000
40 S.	14½ E.				45,000,000

FOREST RESERVES.

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Nonfor- ested.	Forested.	Yellow pine.	Sugar pine.	White pine.
		<i>Acres.</i>	<i>Acres.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>	<i>Fect B. M.</i>
41 S....	2 W..	3,000	7,200	16,000,000	5,000,000	3,000,000
41 S....	1 W..	1,200	9,000	60,000,000	12,000,000	-----
41 S....	1 E...	300	9,900	40,000,000	15,000,000	-----
41 S....	2 E...	2,000	8,200	3,000,000	2,000,000	-----
41 S....	3 E...	3,200	7,000	6,000,000	-----	-----
41 S....	4 E...	2,400	7,800	42,000,000	4,800,000	-----
41 S....	5 E...	-----	10,200	50,000,000	15,000,000	-----
41 S....	6 E...	1,200	9,000	58,000,000	-----	-----
41 S....	7 E...	1,000	9,200	78,000,000	-----	-----
41 S....	8 E...	8,320	2,800	12,000,000	-----	-----
41 S....	9 E...	11,520	-----	-----	-----	-----
41 S....	10 E...	11,520	-----	-----	-----	-----
41 S....	11 E...	10,720	800	4,500,000	-----	-----
41 S....	12 E...	11,520	-----	-----	-----	-----
41 S....	13 E...	3,000	8,520	34,000,000	-----	-----
41 S....	14 E...	-----	11,520	55,000,000	-----	-----
41 S....	14½ E...	8,020	3,500	3,000,000	-----	-----

Area and timber estimates, by townships, of region examined—Continued.

T.	R.	Red fir.	White fir.	Noble fir.	Incense cedar.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
41 S.	2 W.	22,000,000	1,600,000	40,000,000	1,500,000
41 S.	1 W.	28,000,000	3,000,000	5,000,000	1,700,000
41 S.	1 E.	4,240,000	10,000,000	-----	8,000,000
41 S.	2 E.	4,600,000	1,000,000	-----	-----
41 S.	3 E.	4,000,000	-----	-----	-----
41 S.	4 E.	17,800,000	400,000	-----	2,000,000
41 S.	5 E.	30,000,000	4,000,000	-----	1,000,000
41 S.	6 E.	29,500,000	-----	-----	-----
41 S.	7 E.	17,000,000	-----	-----	-----
41 S.	8 E.	2,000,000	-----	-----	-----
41 S.	9 E.	-----	-----	-----	-----
41 S.	10 E.	-----	-----	-----	-----
41 S.	11 E.	-----	-----	-----	-----
41 S.	12 E.	-----	-----	-----	-----
41 S.	13 E.	7,000,000	3,000,000	-----	1,000,000
41 S.	14 E.	-----	-----	-----	-----
41 S.	14½ E.	-----	-----	-----	-----

Areal and timber estimates, by townships, of region examined—Continued.

T.	R.	Alpine hemlock.	Western hemlock.	Engelmann spruce.	Total.
		<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
41 S.	2 W.	-----	-----	-----	89,100,000
41 S.	1 W.	-----	-----	-----	109,700,000
41 S.	1 E.	-----	-----	-----	77,240,000
41 S.	2 E.	-----	-----	-----	10,600,000
41 S.	3 E.	-----	-----	-----	10,000,000
41 S.	4 E.	-----	-----	-----	67,000,000
41 S.	5 E.	-----	-----	-----	100,000,000
41 S.	6 E.	-----	-----	-----	87,500,000
41 S.	7 E.	-----	-----	-----	95,000,000
41 S.	8 E.	-----	-----	-----	14,000,000
41 S.	9 E.	-----	-----	-----	-----
41 S.	10 E.	-----	-----	-----	-----
41 S.	11 E.	-----	-----	-----	4,500,000
41 S.	12 E.	-----	-----	-----	-----
41 S.	13 E.	-----	-----	-----	45,000,000
41 S.	14 E.	-----	-----	-----	55,000,000
41 S.	14½ E.	-----	-----	-----	3,000,000

RECAPITULATION.

Total stand of timber.

Species.	Michigan practice.	Local practice.	Difference.
	<i>Feet B. M.</i>	<i>Feet B. M.</i>	<i>Feet B. M.</i>
Yellow pine	9,477,520,400	6,973,740,000	2,503,780,400
Sugar pine	813,902,100	712,400,000	101,502,100
White pine	130,470,500	88,300,000	42,170,500
Red fir	6,638,264,800	4,358,500,000	2,279,764,800
White fir	1,215,526,000	242,500,000	973,026,000
Noble fir	885,824,400	528,000,000	357,824,400
Incense cedar	91,393,600	44,600,000	46,793,600
Alpine hemlock	609,619,800	308,800,000	300,819,800
Western hemlock	46,718,200	8,500,000	38,218,200
Engelmann spruce	71,969,400	37,000,000	34,969,400
Total	19,981,209,200	13,302,340,000	6,678,869,200

This makes a difference of 33.4 per cent between the two estimates on the amount of timber under the Michigan practice.

There is another "practice" which could be used in estimating the timber in this region. That is the cutting practice of the Pokegama Lumber Company, the largest concern operating in the region. This

“practice” aims to make so thorough a clean up that there shall never be occasion again to log on the tracts they have passed over, at least so far as regards the pine component of the forest. Applying their method to the forest everywhere in the region covered by this statement and including all species of trees fit to manufacture into lumber, I estimate as indicated in the table below, the estimates as reached by Michigan practice being multiplied by the factors given:

	Factor.
Yellow pine	1.35
Sugar pine	1.02
White pine	1.03
Red fir	2.
White fir	3.70
Noble fir	1.04
Incense cedar	1.001
Alpine hemlock	1.002
Western hemlock	1.001
Engelmann spruce	1.1

Applying these factors to our Michigan practice estimates we obtain results as follows:

	Feet B. M.
Yellow pine	12,794,652,540
Sugar pine	830,180,142
White pine	134,384,615
Red fir	13,276,529,600
White fir	4,497,446,200
Noble fir	921,257,376
Incense cedar	91,484,993
Alpine hemlock	610,839,039
Western hemlock	46,764,918
Engelmann spruce	79,166,340
Total	33,282,705,763

These totals would then represent the ultimate quantity of mill timber the region would yield if logged to its utmost capacity. But no one here estimates timber that way, nor do the sawmills ever cut so close unless there be exceptional circumstances making such a practice compulsory. The estimates here named “Michigan practice” are on the basis of a fair, judicious use of the forest.

No attempt has been made to estimate the forest in cubic feet. All such estimates would be the merest guesswork. In a calculation of that sort would naturally enter the immense quantities of small growth lodgepole pine and alpine hemlock that occur on the summit and on the eastern slopes of the Cascades. To estimate the cubic contents of the forest in the region covered by me during the past summer would require at least ten years, provided a reasonable degree of accuracy was demanded.

The factors employed in estimating per "cutting practice" depend chiefly upon the relative proportion that the crown of the tree bears to the trunk; that is to say, upon that portion of the crown which is not too branchy or knotty when trimmed up to be absolutely unavailable for mill use. There is in this respect a good deal of difference between the timber on the west and east sides of the Cascades. The western side grows much longer timber, all through, than does the eastern. The factors are compiled to represent a general average.



LEGEND

- Mountainous, heavily timbered, 4000 to 5000 feet
- Mountainous, heavily timbered, 3000 to 4000 feet
- Mountainous, heavily timbered, 2000 to 3000 feet
- Mountainous, heavily timbered, 1000 to 2000 feet
- Mountainous, heavily timbered, 500 to 1000 feet
- Mountainous, heavily timbered, 200 to 500 feet
- Areas of low hills, 200 to 500 feet
- Mountainous, heavily timbered, 500 to 1000 feet

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 Prepared by the U.S. Geological Survey, under the direction of
 G. H. and Eugene R. Keiser



EGEN



Quantifiable
than 2000
per acre



Quantifiable
to 5000
per acre



Quantifiable
to 10000
per acre



Quantifiable
0 to 250
per acre



Quantifiable
0 to 500
per acre



Quantifiable
00 feet
per



Deforested
areas cover
growth thro
causes.



Deforested
areas cover
growth as t
forest fire

LEGEND

Areas non-forested
marshes, meadows
and agricultural land

Merchantable timber
Less than 2000 feet B.M.
per acre

Merchantable timber
2000 to 2500 feet B.M.
per acre

Merchantable timber
2500 to 3000 feet B.M.
per acre

Merchantable timber
3000 to 3500 feet B.M.
per acre

Areas covered chiefly
brush growths



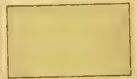
Henry Gannett, Chief Geographer
A. M. Thompson, Geographer in Charge
Trangulation and Topography by Eugene Rasker
Surveyed in 1889-90 and 1901

Scale
Miles
Contour interval 200 feet

LEGEND



lands non-forested as
marshes, meadows
and agricultural lands



merchantable timber
less than 2000 feet B.M.
per acre



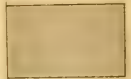
merchantable timber
2000 to 5000 feet B.M.
per acre



merchantable timber
5000 to 10000 feet B.M.
per acre



merchantable timber
10000 to 25000 feet B.M.
per acre



lands carrying chiefly
fish growths

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